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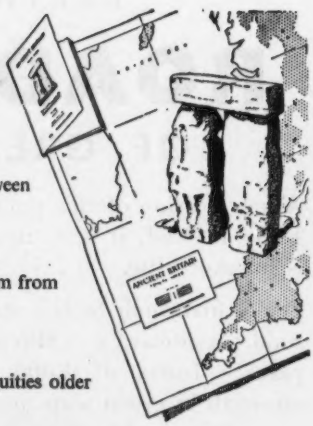

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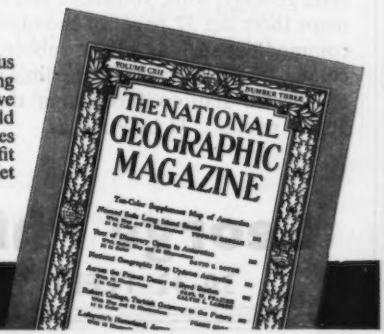

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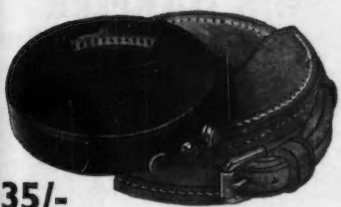

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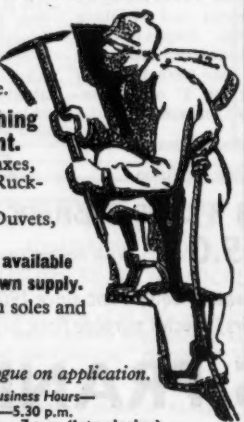

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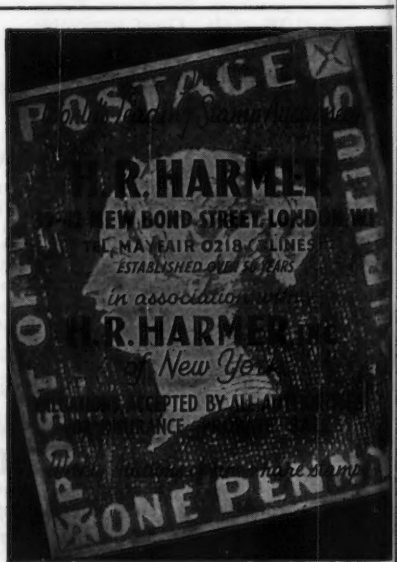

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Portrait of John Palliser at the Royal Geographical Society; painted by his sister Mary, after a water-colour by Miss Severn, 1852

The
GEOGRAPHICAL JOURNAL

Vol CXXV Part 2 *June 1959*

CAPTAIN JOHN PALLISER AND THE EXPLORATION OF WESTERN CANADA

IRENE M. SPRY

ON 23 MAY 1859, THE ROYAL GEOGRAPHICAL SOCIETY awarded its Patron's Medal to Captain John Palliser, F.R.G.S., for the explorations, upon which he was then still engaged, in what is now western Canada.[1] His memory is there kept green, paradoxically enough, by the semi-arid region of the southern Prairies, known to this day as "Palliser's Triangle." As an apt, if accidental, centennial celebration of the work of the explorer who first delineated them on the map, construction of the long-mooted South Saskatchewan Dam project began this year,[2] to bring water to the heart of these dry lands.

Seen from the perspective of a hundred years later, Palliser's work assumes an importance which only some of his contemporaries appreciated. His initiative, given force by the recommendation of the Royal Geographical Society, and supported by the Under-Secretary of State for the Colonies, John Ball, induced a reluctant Imperial government to sponsor a detailed and impartial study of western British North America. The descriptions and records in his reports furnished a wealth of badly needed information. His conclusions were remarkably shrewd. Indeed, if action had been taken on his recommendations as to the formation of a new colony and the Indian problem, both Riel Risings in Red River in 1870 and on the Saskatchewan in 1885 might well have been avoided; while neglect of his warnings as to the character of the land in his celebrated Triangle led to much needless rural distress and depression, notably during the drought of the nineteen-thirties.

I

John Palliser was born in Dublin on 29 January 1817,[3] the eldest son of an eldest son in a wealthy Irish family which stemmed from the Yorkshire stock that produced another Palliser notable in Canadian history, Sir Hugh Palliser,[4] Governor of Newfoundland from 1764–6. It was under the command of this same Sir Hugh that James Cook gained the early experience in surveying which he later used in his great work on the Pacific coast.[5] The founder of the Irish branch of the family was the Archbishop of Cashel, William Palliser (1646–1727), who left a substantial fortune.[6] On the death of his only son this descended to his daughter's son, John Bury of Comeragh, who took the name of Palliser. For four generations the family prospered, accumulating landed property in Co. Waterford, Co. Tipperary and

elsewhere.[7] In 1814, Colonel Wray Palliser, heir apparent to his father, married his father's eighteen year old ward, Anne Gledstanes of Annsgift, a Ward in Chancery with a considerable fortune of her own.[8] The marriage settlement made generous provision for younger children, though the Comeragh estates were to descend in "male tail" to the eldest son, to that John Palliser who became the explorer. Both his father, Colonel Wray Palliser, and his grandfather had houses in the fashionable quarter of Dublin as well as country homes.[9] The grandfather, an earlier John, owned Derryluskan, near Fethard, Co. Tipperary,[10] and Colonel Wray Palliser purchased Comragh (or Comeragh) House (formerly Roxborough House) on the other side of the lovely, wild Comeragh mountains near Kilmacthomas, Co. Waterford, where the family had already built a small shooting lodge.[11]

The explorer's background was, therefore, one of established wealth. He moved (to use his own phrase in another connection) in "the most eligible society." The Duke of Devonshire was a neighbour in virtue of his Lismore estates and a surviving letter from Colonel Wray Palliser to the Duke suggests a degree of easy familiarity.[12] Both an aunt and a sister married men of title[13] and there were family connections with Lord Bury, Earl of Charleville.[14] A tradition of Protestant piety is evident in the explorer's care in observing Sunday while in the western wilds by reading the Church of England service,[15] in wills left by two Miss Pallisers,[16] and in the many clerical connections of the family,[17] though there is nothing puritanical in Palliser's delight in dancing and sociability, and in good cheer generally.[18] A parallel tradition of public service produced numerous Justices of the Peace, Deputy Lieutenants and High Sheriffs in successive generations of Pallisers.[19] Colonel Wray Palliser served from 1810 till his death in 1862 as Colonel in the local Waterford Artillery Militia.[20] As a young man the explorer took up his share of local responsibility after a brief and rather inglorious career at Trinity College, Dublin.[21] He started his course there when he was just 18. As was common then among young men of position he was accorded the privilege (at an extra charge) of dining with the Fellows, and, as was also common, he did not complete his degree. The college records show that he was absent for six out of the twelve terms for which he was registered, and had to repeat his third or Junior Sophister year. On doing so he was cautioned after securing "mediocriter" standing in logic, physics, Greek and Latin, though in astronomy his work was rated "valde bene." He never proceeded to his fourth year. A feeling metaphor in 'Solitary rambles' is perhaps the explanation, ". . . With all the eagerness of a college student, who casts aside his dull books and duller tutors for a burst after the partridges. . . ."

On 20 September 1839, his books cast aside, he became a Captain in the Waterford Artillery Militia,[20] in which his father was Colonel. When the Militia Regiment was "embodied" in 1855 he was absent with leave to attend artillery drill at Woolwich.[22] The Militia Regiment was again unexpectedly "embodied" while he was absent on his Expedition and special efforts were made by his brother-in-law, William Fairholme, to secure "Queen's leave of absence" for him, since conscientious scruples kept his father from asking for such prolonged leave for a son.[23] He was, however, again absent, this time without leave, from a muster in 1863[24] and resigned in 1864,[25] the scion of a rival family, Wm. Villiers Stuart, having succeeded to the Colonelcy on Colonel Wray Palliser's death.[26] The explorer had been High Sheriff of Co. Waterford in 1844[27] and he continued to serve his community on his return from British North America as Justice of the Peace and Deputy Lieutenant of the County until his death.[28]

As his father's heir and future head of a distinguished landed family, it was to be

expected that his life would be one of substantial comfort and considerable prestige in Irish society, spent in caring for his estates and the "industrious and comfortable" tenantry,[29] and in discharging the responsibilities of influential local office. His career must have seemed to be clearly mapped out. Instead, he mapped out the unsettled lands of western British North America, leaving the secure luxury of his family's and his father's way of life, sacrificing local position for travel to the ends of the earth, courting discomfort, hardship and danger with zestful enjoyment.

He and all his four brothers were seized with a restless spirit, perhaps a new flowering of the spirit of adventure which had brought the Archbishop to Ireland as a lad in the seventeenth century.[6] All but the youngest brother were prodigious travellers and in his case the urge to explore the unknown, which characterized this remarkable generation, took the form of a career of invention.[30] John Palliser's book suggests that he had himself already an extensive knowledge of Europe. Frederick, a close friend of Sir Samuel White Baker (who explored the Upper Nile) was big-game hunting with Baker in Ceylon in 1845 and was there again in 1848. He died in Norway.[31] Wray Richard Gledstanes became a naval commander and rescued a French lady from pirates in the China Seas.[32] Edward, of the 7th Hussars, campaigned in India, was hunting big game in Ceylon in 1851, and spent some time in Canada, where he served with the force sent to put down the second Riel Rising in the Saskatchewan country in 1885.[33] William, also in the army, made a number of important ordnance inventions, notably chilled shot; won a knighthood, and became an M.P. in the British House of Commons.[34] The eldest of the four sisters, Grace Penelope, married into an equally travelled Scottish family. Her husband, William Fairholme, while on service in Canada with the 71st Highland Regiment of Foot, visited Niagara Falls in 1838 and in 1840 made a buffalo hunting trip to the "Grand Prairies of the Missouri."[35] His wish to go round the world with Sir George Simpson in 1841[36] came to nothing, but he later spent several years in Ceylon.[37] One of his brothers travelled in Australia[38]; another was lost with the Franklin Expedition in the Arctic.[39] A second Palliser girl, Anna, and Edward, both married into another travelled Scottish family, the Roses of Holme Rose, with a tradition of service in the East India Company.[40]

II

An intimate of such a group of wanderers, it is not surprising that John Palliser shared the mid-nineteenth century interest in exploration. His admiration for Livingstone is evident in his earliest known letter written to the Secretary of the R.G.S. on 29 December 1856.[41] His first North American odyssey was simply a hunting excursion but, like Baker, he graduated from big-game hunting to exploring.[42] At the age of thirty "prairie fever," then a common malady among well-to-do young British sportsmen, probably contracted from his brother-in-law to be, William Fairholme, took him to the unsettled American prairies and mountains of the Upper Missouri and Yellowstone, where he spent some eleven months. He seems to have brought back with him not only hunting trophies and two live buffalo cows and a calf, an antelope, two Virginia deer, a black bear, and a half wolf Indian dog, but a conviction that something should be done to emulate, on the British side of the Border, the exploration, activity and progress in the western American Territories.[43] On his homeward journey on the steamer from Havana to Panama he met an American, "Captain Ringgold, who distinguished himself so highly in the United States South Pacific exploring expedition."[44] This encounter

may well have fired him with the idea of exploring on his own account. The success of his book about the American trip, which was published in 1853 and of which the eighth thousand[45] appeared as a second edition in 1856, must have assured him that there was lively public interest in the prairies of North America. By 1856 he had "conceived," as Sir Roderick Murchison, President of the R.G.S., stated at a meeting of the Society on 25 May 1857, "the project of spending two years in the exploration of that tract" within the limits of British North America "including at least 112,000 square miles, extending from the headwaters of the Assiniboine River to the foot of the Rocky Mountains, and from the northern branch of the Saskatchewan to the 49th parallel of latitude . . . along with the adjoining portion of the Rocky Mountains."

What the circumstances were under which Palliser put the project before the Secretary of the R.G.S., Dr. Norton Shaw, or how early he did so, we do not know. Unhappily, no trace can be found of his "plan" as he originally propounded it. The earliest document which has come to light is the laconic R.G.S. Minute of Council dated 8 December 1856: "19. *Palliser* J.'s Plan for a Survey of a large portion of North America, which was referred to Expedition Committee with power to act at once."[46]

Whatever the specific inspiration[47] and details of his original scheme, Palliser had good reason for considering that there was need for a better knowledge of the country that today is western Canada. By the middle of the nineteenth century British North America had reached a crisis in its development.[48] The British American colonies of the Atlantic seaboard and of the St. Lawrence–Great Lakes valley were hemmed in by the rugged wilderness of the Canadian Shield to the north and by the expanding American Republic to the south.[49] Beyond the rocky wastes of the Shield, the Prairies rolled westward from Lake Winnipeg to the foothills of the Rocky Mountains, the first formidable range in the tremendous Cordilleran mass between the Plains and the Pacific coast; a new colony, British Columbia, was to be established in 1858, while Palliser was still engaged in his explorations. The Shield country, the Great Plains and the mountain ranges of the west were all part of the vast fur trading preserve of the Hudson's Bay Company.[50] Apart from the small settlement at Red River (modern Winnipeg), and a few scattered mission stations, the occupants of this vast territory were wandering Indian bands, half-breed *métis*, and a few fur traders, officers and employees of the Hudson's Bay Company.

In 1856, however, when Palliser proposed to go exploring, it was clear that changes were impending. Settlement was moving steadily across the continent south of the Great Lakes. River steamers and railroads were opening up the Mississippi valley. Late in 1856 a detachment of U.S. troops appeared at Pembina to begin preparations for the establishment of a permanent garrison at St. Joseph's immediately below the Border south of Red River.[51] The Prairies of British North America would not much longer be insulated from outside influences. Already Oregon Territory had been lost by Britain to American settlement. In 1846 the Oregon Treaty made the 49th parallel of latitude the Border between the United States and British territory from the Rocky Mountains westward, right across the mainland to the Pacific coast; the southern valley of the Columbia, with its trading posts and time-honoured fur trade route overland to the Pacific from the St. Lawrence,[52] had thereby been transferred to U.S. jurisdiction. His journey in the American West had given Palliser opportunities of seeing something of the progress of American exploration, American transportation and American settlement. He had reason to know that the Boundary, which he had crossed into British territory from the

Upper Missouri,[53] was not marked. He knew that the United States Government had sponsored and financed a succession of exploring expeditions which, since 1853, had been searching for a feasible railroad route to the Pacific on the United States side of the 49th parallel and which reported voluminously in 1856.[54] He must have known, also, of projects for a railway line from Minnesota through British territory, which some believed offered better prospects for a Pacific railroad route than any in American territory.[55] Would "the encroaching spirit of the U.S."[56] swallow up the Prairies of British North America as it had swallowed up Oregon Territory?

Bitter controversy raged over the privileges of the Hudson's Bay Company in the area and over future policies. Could, or should, the rule of the Company continue? Or could some provision be made for settlement under British auspices and some independent system of government set up? In Canada (then simply the colony in the St. Lawrence–Great Lakes Lowland) there was growing agitation in favour of annexing these western lands. The alternative appeared to be the establishment of a separate British colony on the Plains. Decisions were increasingly urgent but very difficult, since at the time extraordinarily little was known about that huge region.

The servants of the Hudson's Bay Company had, of course, a practical working knowledge of most of it, though even Sir George Simpson, the Company's overseas Governor in charge of its operations in North America from 1840–60, wrote on 15 November 1856: "From Lake Superior westward we know but little of the line of hills dividing the waters of Hudson Bay from those which are discharged through the Mississippi into the Gulf of Mexico . . ."[57] Later, writing of a debate in the House of Commons at which he considered "the same erroneous views" "were set forth as to the results of Capt. Palliser's Expedition, as were paraded last spring at a meeting[58] of the Royal Geographical Society," he complained: "It appears to be supposed the expedition has gone over new ground and made unexpected and valuable discoveries of passes in the Rocky Mountains, of navigable rivers flowing through fertile plains, etc. etc. Whereas the truth is, the scene of Capt. Palliser's operations lies exclusively within the trading districts of Swan River and the Saskatchewan, in which the Company have had posts established for upwards of a century . . . the Company's people . . . explored every stream, valley, range of hills and passage through the Rocky Mountains . . . I have crossed the mountains by three different routes myself, one of which Captain Palliser has since 'discovered' . . ."[59]

The great fur-trader geographers of the North West Company and Hudson's Bay Company, men like Turnor and his still greater pupils, David Thompson and Peter Fidler, had, indeed, in the last years of the eighteenth century and the first years of the nineteenth century explored and mapped much of the country which Palliser's Expedition traversed. Ironically, David Thompson died, forgotten and in penury, in the year in which Palliser set out on his Expedition.[60] When Palliser reported of the winter of 1857–8 that Dr. Hector, the Expedition's geologist, had "with most praiseworthy energy availed himself of this opportunity to lay down the whole of the North Saskatchewan," the ghosts of those enterprising and magnificently able forerunners must have smiled ruefully. Their records did not become public property till much later,[61] though the reports and maps of the Nor'westers and Hudson's Bay men were made available by the Company (with which the North West Company had merged in 1821) for the Arrowsmiths to use in making their pioneer maps.[62] The Arrowsmith map of 1854, which Palliser's Expedition used, therefore embodied all the information then available from Company sources. Even so, there

were still gaps, notably the blank on David Thompson's map along the 49th parallel from 101° to 112° W. What little information had been published (apart from the Arrowsmith maps) consisted of such brief and general accounts as Simpson's own statement about the Bow River Expedition of 1822–23 and his trip through the Rockies in his 'Narrative of a journey round the world, during the years 1841 and 1842.'[63]

Even the savants of the R.G.S. "manifested," as Simpson pointed out, "much ignorance of the country."[64] Murchison, indeed, stated that the territory which Palliser planned to explore "remains almost unknown"[65] and "almost totally unexplored." It was apparently not until after he had given his Presidential Address on 23 May 1859 (at the meeting at which Palliser was awarded the Patron's Medal), that Edward Ellice drew his attention to Thompson's work, about which Arrowsmith then gave him further information.[66] When the Expedition was planned, neither the Council of the R.G.S. nor Palliser seem to have been aware of his illustrious predecessors' work. Palliser says in his final report (p. 192): "It may be stated that, with regard to the general geographical features of the country, we derived great assistance from Arrowsmith's map of British North America, and that we had very frequent cause to admire the singular felicity of judgement with which that geographer had sifted the evidence concerning the geography of localities, when the only information at his command must have been derived from report." Since this "report" was the work of such master explorer-geographer-surveyors as Turnor, Thompson and Fidler it is surprising that this accuracy should cause surprise. It is all the more curious, as Arrowsmith had been at the meetings of the R.G.S. Council and Expedition Committee which discussed and approved Palliser's "Plan."[67] He rose at the meeting of the Society on 25 June 1860, when the chairman suggested that the Company had "withheld" its maps from the public, to say with splendid brevity: "Not at all;" but it remained for Rae to explain that the passes had been traversed and charted years earlier.[68] Blakiston, it is true, alluded to these earlier discoveries in his Report[69] but still claimed to have been the first white man over the Kootenay Pass.[70] Certainly Black's 'Atlas of North America,' dated 1856, which the Colonial Office used, showed the Rockies as an unbroken barrier from the 49th parallel to the Athabasca Pass.[71] (See plate facing p. 164.)

The Hudson's Bay Company, in an attempt to protect its monopoly position, had pursued a "policy of silence."[72] Certainly the Company showed itself ready to assist scientific research on many occasions,[73] but it was not in the habit of volunteering information. Even its own officers were not fully informed as to what information was available. On 16 August 1859 Rae wrote asking Simpson for information for Edward ("Bear") Ellice as to "what Thompson, Fiddler [*sic*] & others did in the way of discovery & survey."[74] Simpson wrote to Ellice on 23 September 1859, "Materials are really difficult to procure: Fidlers [*sic*] charts & notes must be at The Hudson's Bay House, but Thompsons which I believe are worthless, are still in the hands of his Family who have offered them for sale to the Compy and to the English, American and Canadian Governments.—The only sources I can point out for procuring information are the reports and despatches sent home from the country to Fenchurch Street: much that is necessary might be produced [?] out of those dusty archives, but the labour would be great even to a man accustomed to such researches.[75]"—He replied to Rae: ". . . By *laborious search* [my italics] at the H B House, much information as to discovery might be collected, from the reports & journals sent home from the country during the last two centuries, all of which have been carefully preserved. Those connected with the extension of the trade to the

West side of the mountains & the Bow River Expedition in 1822/4, would be found to forestall all that Palliser claims as fresh discovery." In fact Palliser himself claimed very little as "fresh discovery". From the first he had made it clear that his intention was to investigate and verify rumours he had heard from "Red River people" about passes in British territory, such as James Sinclair's report of a pass south of the Athabasca Portage but north of the American border.

There was another reason why such verification was needed: not only was the available information scanty, most of what little there was, was suspect, coming as it did from sources prejudiced either in favour of the Hudson's Bay Company or against it. Neither the public, the Imperial Government, nor the Canadian Government had access to adequate, accurate and impartial information about that part of Her Majesty's possessions in western British North America lying just north of the United States border.[76]

There was therefore ample scope for further exploration and quite sufficient reason for the Imperial Government to sponsor Palliser's project. Indeed, it is surprising that the Government did not itself take any initiative in the matter. It is true that, following discussions with the Hudson's Bay Company, it moved on 5 February 1857 for the appointment of a Select Committee of the House of Commons, to "consider the state of those British Possessions in North America which are under the Administration of the Hudson's Bay Company, or over which they possess a License to Trade"[77]; but this was after Labouchere had already, on January 20, decided in favour of Palliser's Expedition. The Committee began its deliberations on 18 February, started to take evidence on 20 February, and reported on 31 July 1857. Much of the evidence was given by hot partisans or opponents of the Company and confirmed the fact that there was need for fuller impartial information about these territories.

The Canadian Government, on its part, sent out an exploring party of its own in July 1857, under Gladman, to study the route between Lake Superior and Red River (modern Winnipeg), and two further parties in 1858—one under Dawson, to continue work on the problem of access from the Great Lakes to the Plains, and the other under Henry Youle Hind to study the Assiniboine and Saskatchewan country.[78]

III

Meanwhile, on the strength of the Expedition Committee's favourable verdict of 18 December 1856,[80] the R.G.S. had decided to sponsor "Palliser J.'s Plan." Though we know very little about its genesis, the Expedition's exodus is well documented. On 13 January 1857,[81] a formal letter from the Society asked the Secretary of State for the Colonies to contribute £5000 to finance an expedition to be sent out by the Society under Palliser's command, to spend two and possibly three seasons:

1. In examining "the region along the Southern frontier of our territories, between the parallels of 49° and 53° north latitude, and from 100° to 115° west longitude" with a view to surveying "the watershed between the basins of the Missouri and the Saskachewan [*sic*]; also the course of the south branch of the Saskachewan and its tributaries; and . . . the actual line of the frontier, on the parallel of 49°";
2. In exploring "the Rocky Mountains, for the purpose of ascertaining the most southerly pass across to the Pacific, within the British Territory" since the well-known Athabasca Portage was too far north and "totally useless" for horses[82];

3. In reporting on "the natural features and general capabilities of the country" and mapping it. The R.G.S. also advised that scientific assistants should accompany Palliser.

Merivale, the able Permanent Under-Secretary at the Colonial Office, noted on January 14 that John Ball had "taken a good deal of interest in this subject."[83] Ball was the Under-Secretary of State. He came from Co. Waterford[84] and presumably knew Palliser well, as Palliser's first letter found in the Colonial Office files, dated 17 January 1857,[85] is addressed "My dear Ball," and Ball replied in kind.[86] Merivale added: "There can be no doubt of its importance to us, if the Treasury should think such an expenditure permissible," but questioned the advisability of combining an expedition of this kind with a mission for "running the line," a problem which the Foreign Office had then already under consideration.[87] Ball, in turn, recommended the plan to the Chief Secretary of State, Labouchere, especially stressing the "many advantages in giving government assistance to an expedition led by a gentleman of independent position quite uninterested in any of the controversies past or present, respecting the region proposed to be explored. . . ."[83] Merivale had noted "I very much distrust these estimates recollecting what passed when the N. Austr. exp^{n} was undertaken,"[83] but Ball felt that they were within a margin of error of not more than £1000.[83] He urged that the expedition be asked to add to its proposed activities an examination of the route between Lake Superior and Lake Winnipeg,[83] despite the Society's protest against wasting time on these "slightly interesting and well known tracts."[88] Labouchere agreed on January 20 that the scheme should be recommended to the Treasury, but that the Expedition should not make any attempt to mark the boundary officially.[89] The Treasury eventually agreed to the proposed outlay subject to the condition that the Colonial Office should "take upon itself the direct responsibility of seeing that the arrangements are adequate and suitable for the purpose, and also in respect to the expenditure of the proposed grant."[90] The Expedition thus became a government expedition, not one, as originally proposed, under the direction of the R.G.S.[81]

The Colonial Office invoked the assistance of the Royal Society as to scientific personnel, instruments, and observations to be made,[91] and set up a North American Expedition Committee which met on March 16 with General Sir Edward Sabine in the chair, and with Palliser present by invitation.[92] Lieutenant Thomas Blakiston, R.A., who was "known to Palliser" and recommended by Lefroy, and probably also by Murchison,[93] had volunteered to join the Expedition to make magnetic observations. M. Bourgeau, a French botanical collector was suggested, after consultation with Mr. Weddell in Paris, by Sir Wm. Hooker, first Director of Kew Gardens, who was anxious the Expedition should undertake comprehensive botanical collections[94]; Murchison proposed a medical man, Dr. James Hector of Edinburgh, as geologist and naturalist.[95] John W. Sullivan was appointed as Palliser's secretary and astronomical observer at the suggestion of Dr. Purcell of the Naval College, Greenwich.[96] The respective scientific authorities were to draw up separate instructions for the scientific personnel. A list was made of the instruments required and it was arranged that Blakiston should take these as far as possible by sea, because of their delicacy. He was to travel by the Hudson Bay and Saskatchewan route to Fort Carlton on the Saskatchewan, where he was to meet the main party[97] which planned to sail on April 4 for New York.[97]

Sir George Simpson, who was in London, was consulted about routes and methods of travel, as were Richardson and others with first-hand experience of the North-west Territory.[98] After delay over negotiations with the Treasury the Colonial Office

finally advised Palliser on March 28 that he had been appointed to the command of the Expedition.[99]

John Palliser was one of the very few Britons, perhaps the only one, available with a background which qualified him to undertake this responsibility. Almost every one else (apart from Indians and half-breeds) who had had any effective experience of travel on the Prairies of North America was involved in the fur trade as a servant of the Hudson's Bay Company or was among the "free traders" who were trying to break its monopoly.[100] Earlier explorers and scientists who had penetrated west of the Lake of the Woods, like Sir John Richardson, Sir George Back and Sir Henry Lefroy, had travelled by the traditional Hudson's Bay Company route along the northern Saskatchewan and had done most of their work in the northern forests and sub-arctic Barrens. Palliser, as Ball pointed out, was independent but still had the necessary experience. He had travelled and lived from 2 September 1847 to late July 1848 in the wild prairie and mountain country of the Upper Missouri. He had encountered the warlike Plains Indians and had got to know something of their ways and how to get on with them. He had made friends with fur traders and voyageurs from the Hudson's Bay territories north of the U.S. border, as well as with American fur traders. He had learnt how to take care of himself on the Western Plains and was, as Murchison said, "thoroughly inured to everything a man can suffer in North American travel . . . a man of great strength and endurance." He had shown himself to be fearless and resourceful. He had learnt how to travel and camp alone; what equipment and what clothes were needed; and, at a pinch, even how to make a buckskin outfit for himself, like the one he is seen wearing in the portrait facing page 149. He knew how to forage for himself. He found buffalo-hunting "a noble sport" and was adept at it—a necessary accomplishment for the leader of a western expedition which proposed to "live off the land," an idea which he had propounded in his book in 1853. He wrote: "Beyond your guns and horses, with their several appurtenances, you will absolutely require nothing on the prairie but your knife, flint and steel, and pipe, an iron ladle for melting lead, a tin mug, and two iron kettles—one for cooking, the other for boiling coffee—with iron covers to them, which will respectively do for frying meat, and for roasting coffee.

"Before leaving the Settlements, provide yourself with lead, tobacco, coffee, sugar, salt, needles, awls, strong thread, and shoemaker's wax, and also one or two dressed skins, for making and mending mocassins; and with this equipment, you may pass from Independence[101] to the Pacific Ocean."

On all these counts and as, in addition, he could speak French fluently with the *métis* guides, he was admirably qualified to undertake the type of expedition he had originally proposed. This, according to Murchison, was a "journey at his own expense with no other companions than those he might engage as voyageurs and hunters to join him in traversing the Indian territory."

But the age of individual enterprise in exploration was coming to an end and a new age of exploration by teams of scientists was beginning. Palliser, despite his studies at Trinity College, Dublin, had no pretensions to being a scientist. The R.G.S. decided that, although he was "himself conversant with the use of the instruments which have been supplied by Government," "it was evident that without the aid of fellow travellers trained to accurate research and accustomed to the use of scientific instruments, no very accurate results could be expected from the expedition." In place of solitary adventure, Palliser found himself charged with responsibility for organizing the work of four scientists and for dealing with all the business

transactions and accounts involved in providing for their transport, equipment, support, reports and specimens. He does not seem to have been an experienced administrator. Simpson rather acidly observed that he was "quite ignorant of business, and unsuited for the duties of the expedition."[102] This may well have been a just appraisal of his capacity in business matters, though there were other causes, and to spare, for the long drawn out wrangle with the Government and the Hudson's Bay Company over the Expedition's accounts.[103] He may have been, too, as he himself wrote earlier, "more accustomed to the use of the rifle and hunting-knife than to that of the pen." Though he was in fact a gay and talented diarist, there does seem to have been some difficulty over the daily journal[104] and the compilation of the final report.[105] It is also possible that, not being a trained scientist, he may have lacked something of rigid precision in his observations.[106] Simpson, moreover, believed him to be "easily gained over by a little flattery & attention"[107]; though this judgement may, perhaps, throw more light on Simpson's methods than on Palliser's pliability. While some of his recommendations coincided with Simpson's views and he certainly relished Simpson's hospitality, some of his conclusions seem to have been directly adverse to the interests of the Company and his private report of 13 March 1858 to the Secretary of State suggests a genuinely independent view of the problems at issue.[108] Whatever his susceptibility to Simpson's influence, it does appear that on some occasions he deferred to advice and acceded to importunities against his own judgement: for example, in turning back just above the Elbow of the South Saskatchewan in 1857, which may be defended as paying prudent heed to local knowledge; and, less accountably, letting his friend Captain Brisco take the "Stoney (Assiniboine) hunter" they nicknamed Nimrod, into hostile Indian country in 1859.[109]

Against such possible limitations must, however, be set additional assets: his lusty and indomitable good humour, breezy geniality, warm-hearted friendliness and the generous nature evident in the acknowledgements in his reports to the other members of the Expedition. Hector wrote to Palliser of his "old jolly and open manner."[110] He was appreciative of favours and anxious to give tangible expression to his appreciation; for example, to a hotel keeper at Sauk Rapids for the recovery of lost rings and watches.[111] Simpson described Palliser as a "very pleasant, well-intentioned man."[112] Simpson wrote in another letter from Lachine on 18 February 1858 to Johnson at Fort Garry: "He is a very good fellow; I could wish we had always to deal with such men; he is easily satisfied—makes all reasonable allowances for what is unavoidable of discomfort and self-denial in such a region—and is ready to admit the disposition to be useful & friendly. . . ."[113] Though cheerfully prepared to take hardship in his stride, he was sociable and enjoyed good company, and good food and wine. He gave two balls while wintering at Fort Edmonton[114] and he wrote to Simpson from New York (20 February 1858) that he hoped soon to join Simpson's "hospitable circle" and that he had not eaten a good slice of mutton "nor drunk one good glass of Port wine" since he left Simpson's dinner table,[115] and again that he often thought "of the jovial dinner party we had at LaChine."[116] His sense of humour and cheerfulness must have helped him to maintain the evidently good relations within the party through some undoubtedly very trying experiences, with only one defection. Lieutenant (later Captain) Blakiston, R.A., the magnetic observer, "threw off" Palliser's command[117] on 11 August 1858 during the second season's work, for reasons which have never been quite clear; but even he wrote, in reporting informally to Sabine that he had "split with Palliser," that this was "only officially for we are as good friends as ever."[118] Con-

ceivably the Expedition might have accomplished more if Palliser had had a single-minded interest in terrestrial magnetism and none in hunting and balls, but in that case there might never have been any Expedition at all. His zest for adventure and perhaps rather slapdash confidence in the possibility of overcoming difficulties were assets of no mean order in his original initiative in proposing and undertaking the exploration and in carrying it to completion.

His official instructions from the Colonial Office were finally ready on 31 March 1857,[119] but he had suddenly fallen ill, so ill that Hooker wrote asking whether Hector and Bourgeau should go ahead as planned to await the arrival of Palliser "if he recovers."[120] For two days he was prostrate and delirious, but recover he did and the Expedition sailed at last on May 16.[121]

IV

Its work fell into three sections: It was to report on (1) the canoe route from Lake Superior to Red River; (2) the southern plains; and (3) possible passes through the Rocky Mountains north of the U.S. Border but south of the pass which had been the traditional overland fur trade route via the Athabasca Portage to the Boat Encampment at the northern end of the Big Bend of the Columbia River.

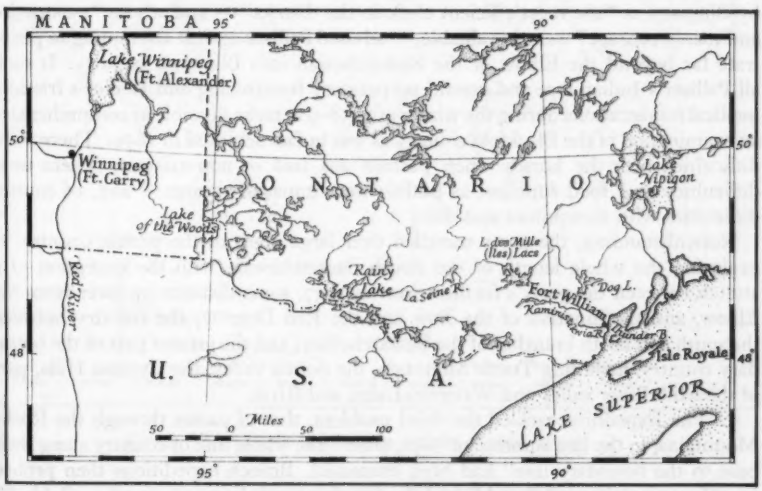


Fig. 1. The canoe route from Lake Superior to Red River

1. The Expedition devoted a month (15 June to 11 July 1857) to the first task. An accident to one of the canoes interrupted exploration of an alternative route by way of a small and, as Palliser reported, in any case unnavigable, tributary of the Kaministikwia,[122] but the party took numerous observations for latitude and longitude and kept a record of the character of the route and of the country through which it passed. Hector made numerous geological sections and Bourgeau collected botanical specimens.

2. Exploration of the southern Plains occupied the remainder of the summer of

1857, and part of each of the two ensuing summers. The Expedition spent the winter of 1857–8 based on Fort Carlton and that of 1858–9 on Fort Edmonton, making a number of winter trips and recording magnetic, geological and meteorological observations.

Difficulties beset the Expedition on the Plains. There were difficulties over guides and local employees. On his arrival at Red River Palliser found that the intrepid guide he had counted on, Boucharville, with whom he had travelled ten years earlier, had been killed by the Sioux.[123] Palliser's instructions had insisted that he should avoid trouble with the Indians and the Indian and half-breed guides and men employed locally were extremely nervous of the Sioux, Blackfeet, Piegans and Plains Assiniboines and unwilling to penetrate their territory. This caused delay since the Expedition could not travel straight across the Plains but had to turn back and later made new attempts to cover dangerous ground. Simpson had written of the south branch of the Saskatchewan that "its upper waters are so much infested with warlike tribes, that, though believed to be rich in game, it is yet seldom ascended by traders. Some years back, indeed, three or four posts were established on its banks; but they were soon abandoned, after the sacrificing of several lives in their defence."[124] Rumours were constantly afloat about Indian depredations, such as the (as it proved, unfounded) report that Sioux had murdered Lord Richard Grosvenor and his party.[125] Even the outstanding guide and hunter, James McKay, described by Simpson as "the most efficient clerk in the district"[126] and whose "experience and manly courage" were so valuable,[127] advised Palliser against attempting to penetrate far beyond the Elbow of the Saskatchewan into Blackfoot country. It took all Palliser's Indian lore and careful preparatory fraternizing and Hector's friendly medical ministrations during the winter of 1858–9 to make possible as comprehensive an examination of the Blackfoot country as was in fact achieved in 1859. There were difficulties over the horses when pasture was bad or non-existent. There were difficulties over food supplies, as buffalo were unusually scarce[128] and, of course, difficulties with mosquitoes and flies!

Notwithstanding, the party travelled over large areas of the prairie country,[129] exploring the whole length of the South Saskatchewan, with the exception of a stretch between the party's furthest west in 1857, some distance up river from the Elbow, and the junction of the Bow and the Red Deer[130]; the country between the south and north branches of the Saskatchewan; and the greater part of the boundary country, including Turtle Mountain, the Souris valley, the Cypress Hills, part of the Milk River valley and Waterton Lakes and River.

3. The Expedition tackled the third problem, that of passes through the Rocky Mountains, in the late summer of 1858, after " the whole line of country along their base to the boundary line" had been examined. Branch expeditions then probed into the mountains and "established the fact that several passes . . . are available for horses, and by which, with a reasonable outlay, a road could be made, connecting the Kootanie and Columbia valleys with the plains of the Saskatchewan." Four passes were established that season, the Kananaskis, Vermilion, North (or British) Kootenay and Kicking Horse Passes, and another reported from local information, the Crow's Nest Pass.[131] The following season Palliser and Sullivan searched for a possible route from the passes in the south through British territory to the Pacific, while Hector examined yet another pass further north, leading from the headwaters of the North Saskatchewan to the Columbia. This turned out to be the so-called Howse Pass, originally discovered by David Thompson in 1807 but after trouble with the Piegan Indians, abandoned for the Athabasca Portage route further north.[132]

Hector's efforts to find a way on from the Columbia to the Fraser and the coast were frustrated by heavy fallen timber and a shortage of food and pasture, which had also given Palliser and Sullivan trouble on the southern route. Palliser "succeeded in forcing" his way westward until he "fell on the trail of the Hudson's Bay Company, . . . over the Cascade Range . . ." "altogether north of the boundary line . . ." Here he established contact with the American members of the Boundary Commission which, with a British group under Major Hawkins, had been working eastward from the Pacific coast.[133] He satisfied himself that it was possible, though

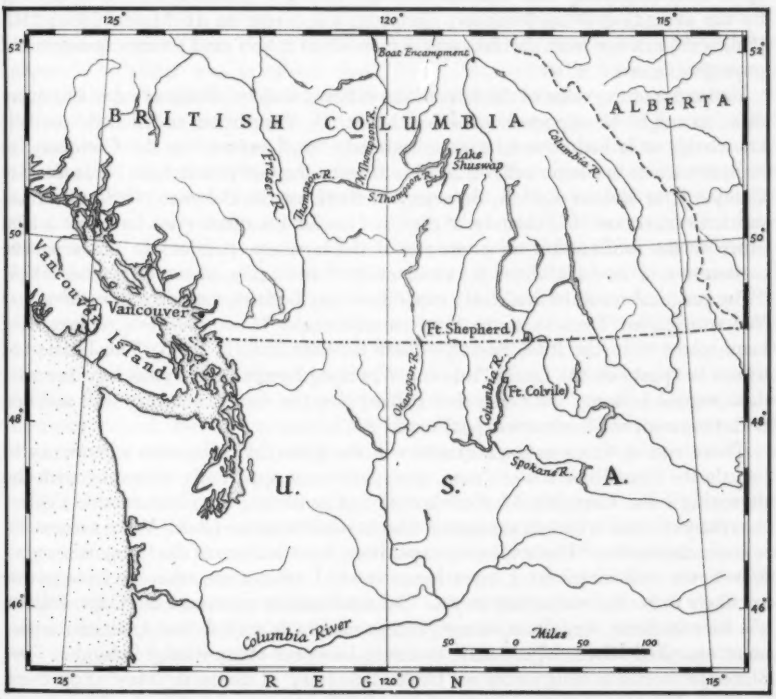


Fig. 2. The Rocky Mountains to the Pacific coast

extremely difficult, to reach the west coast entirely through British territory. From this point on, though further difficulties delayed the party en route down the Columbia to the coast,[134] and though Hector made some further geological investigations of the coal structures on Vancouver Island, their route lay largely in the U.S.A. and in comparatively well known country. The Expedition's work was done.

V

Had it been worth while? Or had it, as detractors suggested, been merely a "job" to enable Palliser to indulge his taste for buffalo hunting at the public expense? The veteran fur trader and Whig politician, Edward ("Bear") Ellice, wrote from

St. Anthony, Minnesota, on 14 September 1858: "These plans [for steamship connections from Red River to the Rockies from the U.S.A.] will probably be in active operation, when the gentleman I think his name is Paliser [*sic*], who to satiate his appetite for Buffalo and other hunting, had sufficient influence with the Colonial Office, to send him out on a statistical and Geological inquiry at the public expense, and the Commission employed by the Government of Canada . . . are making their reports . . ."[135] Writing as a Whig to the new Tory Chief Secretary of State for the Colonies, Bulwer Lytton, he disdainfully called Palliser "your Buffalo Hunter,"[136] apparently forgetting that command of the Expedition was entrusted to Palliser by the preceding Whig Minister. Simpson, too, wrote on 10 March 1860: "His [Palliser's] mission from the first was very much of a 'job' and a very expensive and unprofitable one . . ."[137]

Estimates of the value of the Expedition differed widely. Hudson's Bay Company men, as might be expected, considered that the Expedition added little to their knowledge as it had covered a region already "well known" to the Company, as Simpson wrote in a letter sent on 20 May 1859 by the Governor of the Hudson's Bay Company, to Bulwer Lytton, Secretary of State for the Colonies.[138] Simpson had written earlier, on 18 February 1858, ". . . So far his discoveries have not added much to the information we possessed of the territory, previous to this scientific exploration of its capabilities & resources"[139]; and again on 24 December 1858: "The practical result of this costly expedition may be fairly set down as *nothing*."[140] Rae wrote from Toronto of the first season's work: "I see Palliser's reports have been read before the R.G. Society—there is really little in them. The Indians of whom he speaks on the Lac la Pluie and Winnipeg Rivers are the most lazy improvident rogues unhung," and also that Palliser "by the way is not very well satisfied with the result of his summers [*sic*] work."[141]

There was at times in some quarters in the Colonial Office also a tendency to belittle the Expedition's usefulness, disappointment apparently mounting with the mounting bills. Certainly Merivale's note to Carnarvon, the Conservative Under-Secretary of State who had succeeded Chichester Fortescue (Ball's Whig successor), is not enthusiastic: "This exploring expedition was a scheme of the last government, & however well imagined, I must honestly say I cannot see what we have got or are likely to get for our money as yet. The information received from Capt. Palliser has been hitherto very unimportant, except merely as regards the American settlement near Red River. There may, however, be stores of knowledge behind . . ."[142] Since John Ball's resignation as Under-Secretary of State in May 1857 there seems to have been no one at the Colonial Office[143] interested in the Expedition, though Merivale had written of Palliser's 1857 report about American activity south of Red River: "These are very important facts for their bearing on present questions,"[144] and of his statement in a letter from Fort Garry, dated 3 May 1858, "of the easy navigation of the Red River by steamer," that it was "important."[145] Carnarvon had noted on Palliser's report of 5 June 1858 from Carlton, when it reached the Colonial Office on September 6, that the coal reported near the 49th parallel "may one day become very useful—especially if a line of railway can be carried through British N. America from sea to sea."[146] Bulwer Lytton, the Chief Secretary of State, retorted in a further note written on 10 September 1858 that the coal was "described as inferior" and felt "the whole description looks cheerless eno' for a Colony."[146] Minutes of September 1858 on a letter from an army surgeon formerly stationed at Red River refer disparagingly to "meagre statements which are sent to the Colonial Office by those who profess to give us

information"[147] and Lytton added: "Capt. Palliser's account is meagre and cheerless —Little said about those smiling Prairies at Saskatchewan which American Husbandmen are said to covet . . . and when out of the buffalo ground there seems little to eat, except Wolves & Foxes with a queer looking Squirrell [*sic*]."[147] The Colonial Office wrote accordingly to the Governor General of Canada, Sir E. Head, to ask for information from officers stationed at Red River.[148]

By January 15 of the next year, however, Lytton was noting in another context that he thought what Palliser had already furnished was "of value in the H.B. Controversy."[149] Palliser's report of passes through the Rockies written on 7 October 1858, which arrived ten days later, was received with general acclaim. Merivale described it as "important" and Lytton added "this is a most important paper."[150] Palliser was informed that "Sir E. B. Lytton is strongly impressed with the importance of the discoveries made by the party under your command."[150] An application was made to the Treasury for a further appropriation to extend the Expedition's work, reversing Lytton's recent decision that this could not be done.[151] On 18 June 1859, the Whig government came into office again, with Newcastle as Chief Secretary and Chichester Fortescue again as Under-Secretary of State for the Colonies. On 3 February 1860, Simpson wrote that Palliser attributed "the whole blame of the dilemma in which he has been placed [by the abrupt stoppage of further supplies when the third Parliamentary appropriation had been exhausted] to unfriendly influence at the Colonial Office."[152] Elliot (then senior clerk at the Colonial Office) commented in a minute at the end of a letter from Blakiston dated 24 October 1859: ". . . this expedition was a very peculiar one . . ."[153] and again at the end of a letter from Palliser dated 20 December 1860: "He was a Captain of the Militia who had a great wish to travel in North America, for a year, I believe, as he first announced. But he protracted the Expedition for upwards of two years, and made vast journies [sic] and voyages in his favourite pursuit, at the expense of this country."[154]

The Royal Geographical Society, on the other hand, awarded Palliser the Patron's Gold Medal in 1859 and Carnarvon, accepting it on Palliser's behalf, in an appreciative speech described the Expedition as one of the three vital links in what he hoped would be one long line of communication from the Atlantic to the Pacific. Captain S. Anderson, R.E., of the Boundary Commission, stated in 1876 at a meeting of the R.G.S. that ". . . the extensive explorations of these gentlemen in 1857 and the two following years formed the basis of all subsequent surveying operations in the north-west territory." The Commission's work at Pembina "confirmed the observations that had been previously taken by Captain Palliser and Mr. Sullivan, his secretary." It was reported in 1877 that Sandford Fleming, Engineer-in-Chief of the C.P.R., had said "that he found Mr. Palliser's report of great use and when going over the same ground always took a copy of it with him."[155] In 1873 the Director of the Canadian Geological Survey giving instructions to Dr. R. Bell wrote ". . . inasmuch as the greater part of the region to which your operations will be confined has already been generally explored and reported on by Captain Palliser and by Mr. H. Y. Hind, that detailed observations and surveys are now required, rather than a hasty and general examination of a large area, which would probably not enable you to give much information not already available in the published reports and maps of these able explorers."[156]

The Expedition did indisputably leave its mark on the map of Canada in many notable place names: The Kicking Horse Pass, Kananaskis Pass, Palliser River and Range, Waterton Lakes and River, Mount Ball, Mount Hector (christened later

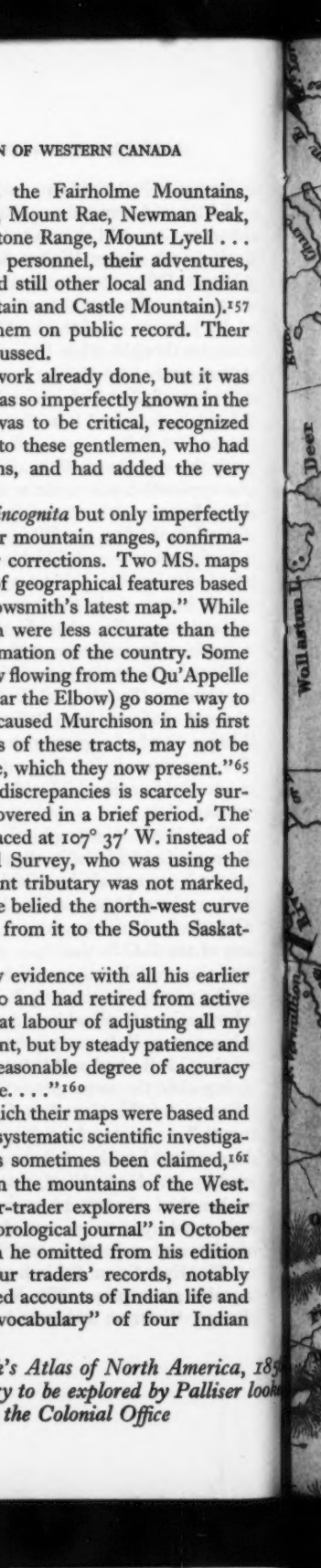
by Dawson), Mount Bourgeau, Mount Blakiston, the Fairholme Mountains, Mount Sullivan, Mount Murchison, Mount Rundle, Mount Rae, Newman Peak, Fisher Range, Abram Gates, Mount Lefroy, Livingstone Range, Mount Lyell . . . all these and others commemorate the Expedition's personnel, their adventures, heroes, patrons, friends and relatives. They recorded still other local and Indian names, or descriptive names (such as Cascade Mountain and Castle Mountain).[157] These names survive because the Expedition put them on public record. Their maps and reports were published, circulated and discussed.

Part of the Expedition's work was duplication of work already done, but it was necessary duplication, since their predecessors' work was so imperfectly known in the mid-nineteenth century. Even Rae, inclined as he was to be critical, recognized that "this did not detract from the high credit due to these gentlemen, who had confirmed the correctness of previous observations, and had added the very valuable observations they themselves had made."

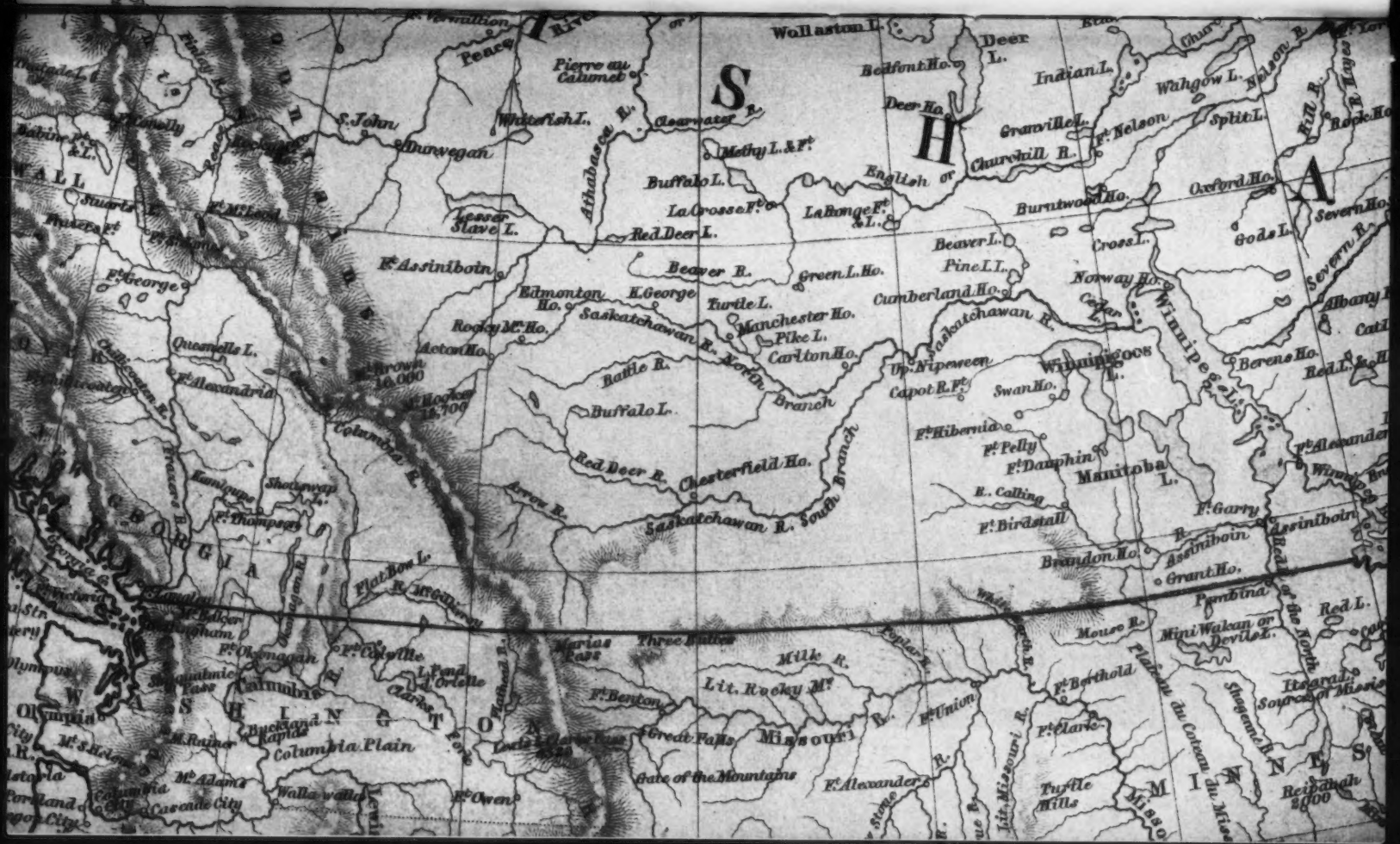
Though the Expedition traversed *terra* not totally *incognita* but only imperfectly known, and did not discover any great new rivers nor mountain ranges, confirmation of the old maps was valuable, as were the minor corrections. Two MS. maps in the Public Record Office[158] compare the location of geographical features based on the Expedition's observations with those on "Arrowsmith's latest map." While these indicate a number of revisions, some of which were less accurate than the earlier observations, they confirm the general conformation of the country. Some significant additions (for example, of the stream Aiktow flowing from the Qu'Appelle drainage system into the South Saskatchewan river near the Elbow) go some way to filling in the gaps on Arrowsmith's map which had caused Murchison in his first letter to the Colonial Office to hope "that our Maps of these tracts, may not be suffered to remain in the bare and unsatisfactory state, which they now present."[65] That there were, even so, still omissions and some discrepancies is scarcely surprising, in view of the enormous extent of country covered in a brief period. The Elbow of the South Saskatchewan, for instance, is placed at 107° 37′ W. instead of 106° 38′ W.; while Bell of the Canadian Geological Survey, who was using the Palliser map, remarked in 1873 that the Swift Current tributary was not marked, and that the north-east trend of Last Mountain Lake belied the north-west curve indicated on the map, as did the absence of any link from it to the South Saskatchewan.[159]

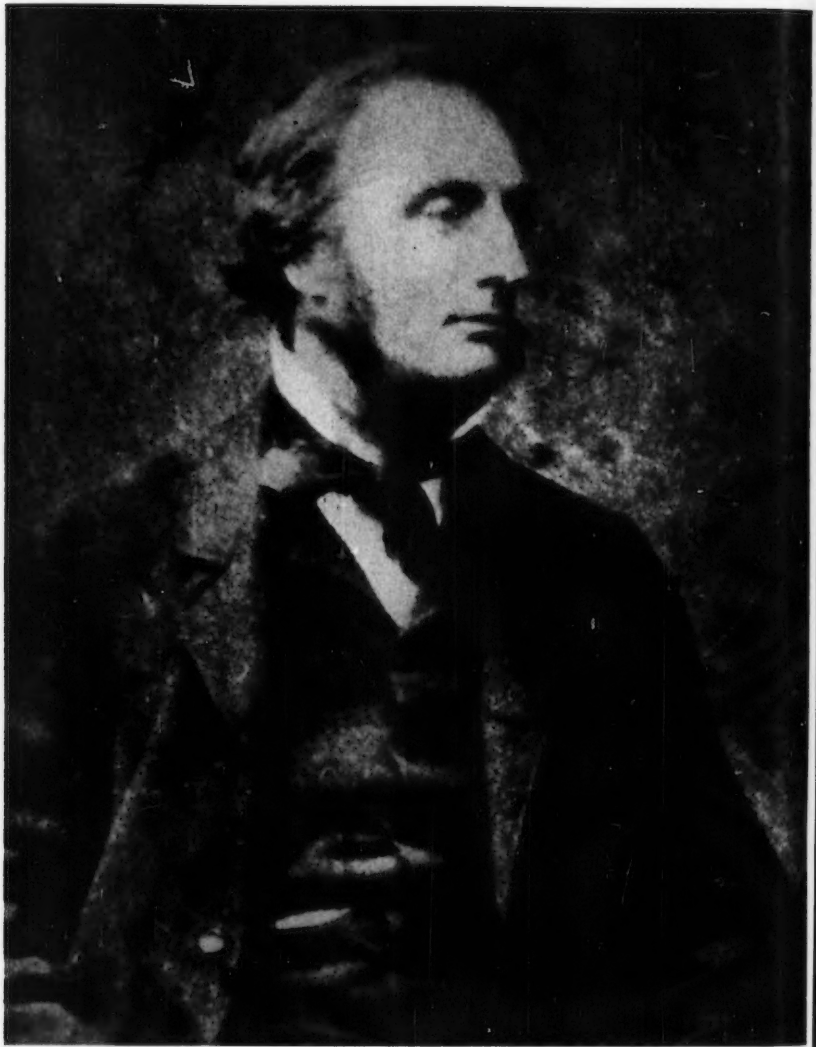
Arrowsmith himself set to work to collate the new evidence with all his earlier information (despite the fact that he was then over 70 and had retired from active publication of maps in 1861). He wrote of "the great labour of adjusting all my documents,—many of them confessedly very discordant, but by steady patience and application, [the map] could be brought within a reasonable degree of accuracy certainly more so than ever had been arrived at before. . . ."[160]

Besides making the astronomical observations on which their maps were based and computing altitudes, the Expedition undertook other systematic scientific investigations and records. Here again they were not, as has sometimes been claimed,[161] the first to make such attempts on the Prairies and in the mountains of the West. In this matter, too, David Thompson and other fur-trader explorers were their precursors. David Thompson "began to keep a Meteorological journal" in October 1789.[162] Coues mentions meteorological tables which he omitted from his edition of the younger Alexander Henry's journals.[163] Fur traders' records, notably those of David Thompson and Henry, contain detailed accounts of Indian life and in Henry's journal there is a "Quinquelingual vocabulary" of four Indian



Part of plate 1 in Black's Atlas of North America, 185
showing what the country to be explored by Palliser look
like on the map used by the Colonial Office


Wollaston L.
Deer L.
Peace R.
Pierre au Calumet
Bedford Ho.
Indian L.
Wahgow L.
Nelson R.
Churchill R.
Deer Ho.
Granville L.
Ft Nelson
Split L.
Rock Ho
S.
H
A
Whitefish L.
Clearwater R.
Athabasca R.
S. John
Dunvegan
Methy L. & Ft.
Churchill R.
Buffalo L.
English or
Oxford Ho.
Burntwood Ho.
Severn Ho.
Severn R.
Gods L.
La Crosse Ft.
La Range Ft. & L.
Lesser Slave L.
Red Deer L.
Beaver L.
Cross L.
Pine I. L.
Ft Assiniboin
Beaver R.
Green L. Ho.
Norway Ho.
Ft George
Edmonton Ho.
E. George
Turtle L.
Cumberland Ho.
Albany R.
Rocky Mt. Ho.
Saskatchewan R.
Manchester Ho.
Pike L.
Carlton Ho.
Up. Nipawin
Winnipegoos L.
Winnipeg R.
Berens Ho.
Red L.
Quesnelle L.
Ft Alexandria
Actor Ho.
Ft Brown 16,000
Ft Hope 15,700
Battle R.
North Branch
Capot R. Ft
Swan Ho.
Buffalo L.
Ft Hibernia
Ft Pelly
Ft Dauphin
Manitoba L.
Ft Alexander
Columbia R.
Fraser R.
Kamloops
Shuswap L.
Ft Thompson
Red Deer R.
Chesterfield Ho.
Arrow R.
Saskatchewan R. South Branch
E. Calling
Ft Garry
Ft Birdstall
Assiniboin R.
Brandon Ho.
Grant Ho.
Flat Bow L.
Pembina
Red L.
Mouse R.
Mini Wakan or Devil L.
Ft Okanagan
Ft Colville
Marias Pass
Three Buttes
Milk R.
Lit. Rocky Mt.
Ft Berthold
Columbia
L. Pend d'Oreille
Clarke R.
Ft Benton
Ft Union
Ft Clark
Olympia
Great Falls
Missouri R.
Mt. Rainer
Columbia Plain
Gate of the Mountains
Ft Alexander
Mt. Adams
Walla walla
Ft Owen
Cascade City
Turtle Mills
Reipahah 2000
Lit. Missouri R.
Missouri R.



By courtesy of the Canadian Pacific Railway, Palliser Hotel, Calgary

John Palliser in 1860

languages.[164] Apparently in ignorance of this earlier work, which had not then been published and was not available in the United Kingdom,[165] Palliser's party laid new foundations for subsequent systematic recording of scientific data about the country comprising the modern Canadian provinces of Manitoba, Saskatchewan, Alberta and British Columbia. They collected series of meteorological data, including measurements of temperature at various depths underground and inside the trunks of trees, some with such outside help as that of several officers of the Hudson's Bay Company and the Rev. Thomas Woolsey, a missionary. They described and made extensive collections of plants, birds and other animals. Hector's geological surveys, his multitudinous geological sections, and his collection of rock specimens and fossils formed the basis of the first comprehensive report of the geology of the whole enormous region. G. M. Dawson, later Director of the Geological Survey of Canada, wrote: "To him [Hector] the first really trustworthy general geological map of the interior portion of B.N. America is due; . . ."[166] Blakiston, with the help of his colleagues, made hourly magnetic observations at Carlton for five months, and made other observations elsewhere. Notes were kept of the characteristics of the Plains Indian tribes encountered and their vocabularies. The scientific "big wigs" (in Palliser's phrase) seem to have been well satisfied with the results. Sabine wrote that Blakiston's observations had "proved to be of considerable theoretical importance."[167] Hooker warmly commended the botanical work Bourgeau had done.[168] Selwyn referred to Hector's "admirable sketch of the geological structure of this region, published in the *Journal of the Geological Society* (Vol. XVII, 1861)."[169] The sum of the Expedition's observations made a most respectable contribution to progress in the natural sciences.

It made, as well, an important contribution to better knowledge of the country. The summary report of 1863 presented a masterly synthesis of the details of day-to-day experiences and observations. The fact that the Expedition had not crossed the Plains in a straight line from east to west but had perforce ranged north and south, had given opportunities for studying an enormous extent of territory. The coherent, integrated picture given in the report of the topography, geology and climate of this whole vast country was a remarkable achievement. It set out the general relationship of a "fertile belt" to the semi-arid land of the famous Triangle which was the key to an understanding of the nature of the Prairies and their "capabilities." It showed that the "more or less arid" central American desert extended from United States territory "a short way into the British territory, forming a triangle, having for its base the 49th parallel from longitude 100° to 114° W., with its apex reaching to the 52nd parallel of latitude."[170] This was a "region of arid plains, devoid of timber or pasture of good quality. Even on the alluvial points in the bottom of the valley [of the South Saskatchewan] trees and shrubs only occur in a few isolated patches. The steep and lofty sides of the valley are composed of calcareous marls and clays that are baked into a compact mass under the heat of the parching sun. The sage and the cactus abound, and the whole of the scanty vegetation bespeaks an arid climate." Surrounding this semi-arid area, Palliser reported a fertile belt of country lying along the Assiniboine and Red Rivers in the east; along the valley of the North Saskatchewan; and in the west in a wedge along the foot of the Rocky Mountains, narrowing down to a width of 20 miles at the U.S. boundary. "Almost everywhere along the course of the North Saskatchewan are to be found eligible situations for agricultural settlement" with good soil, sufficient accessible timber in the north for local use, and open areas "denuded of timber" by recurrent fires where settlers would be spared the labour of clearing the land. The coal

deposits on the Upper Saskatchewan and near the Border at today's Estevan, which the Expedition reported, would be useful, while plentiful fisheries would be an important supplement to the settlers' food supply. While there was rich natural pasture and excellent hay could be made, so that conditions were favourable for stock raising," . . . The capabilities of this country and its climate, for the success of cereals" had "hardly been sufficiently tested" but prospects seemed promising, despite the short growing season and such dangers as late and early frosts, storms and grasshoppers—hazards which ever since have plagued prairie farmers. There is an admirable account of the characteristics of Prairie rivers and a prescient comment on Red River floods, with ingenious proposals for their prevention.

The Report depicted very clearly the contrast between the Plains and the Shield country to the east and the mountain country in the far west. The sum of the observations of the various branch expeditions in the Mountains, and especially Hector's careful geological observations, put on record a mass of new material.

As the first impartial observers[171] to look at the region from the point of view of possible settlement (which had requirements vastly different from those of the fur trade), and as observers, moreover, who had stayed long enough in the country to get to know it well, the members of the Expedition were in a position to give independent evidence of special value in the controversy then raging as to policy.[172] Palliser's original instructions had stressed scientific objectives: the Expedition was not at first intended to "bear a political or commercial character,"[173] but Palliser volunteered "speculations" (in Merivale's phrase) on policy[174] and later, 3 July 1858, on Lytton's instructions, Carnarvon asked him confidentially to answer some leading questions involving problems of policy as well as of the physical character of the country.[175] Palliser's reply, dated Fort Edmonton (20 May 1859) did not reach the Colonial Office until 5 September 1859, more than a year later, by which time Lytton, with his trans-continental dreams, had been displaced at the Colonial Office by Newcastle, who struggled unavailingly with the problem of establishing a new colony at Red River and on the Saskatchewan.

How far Palliser's reports influenced policy is difficult to determine. Merivale, Carnarvon and Stanley (who was very briefly at the Colonial Office at the beginning of the Derby administration) initialled Palliser's urgent private letter of 13 March 1858, but only Merivale and Stanley commented on it. Their comments do not go beyond the impossibility of the Hudson's Bay Company maintaining its monopoly position, and the obstacles to annexation by Canada.[174] Lytton quoted a passage from it in the House of Commons during the debate on the Hudson's Bay Company on 20 July 1858.[175a] Annotations on other despatches show that both Lytton and Newcastle read at least some of them and considered them important.[176] When the Company's exclusive licence of trade in the Indian Territories lapsed in 1859, Merivale made a suggestion as to licensing fur traders[177] which has much in common with Palliser's proposals in his private despatch; Newcastle's abortive attempts to establish a separate colony on the Western Plains may in part reflect Palliser's advice; and Chichester Fortescue, then Whig Under-Secretary of State for the Colonies, wrote on 5 August 1859 with reference to a project for communication between Lake Superior and Red River a minute[178] that reads like an echo of Palliser's report.

Not only statesmen and Civil Servants, but entrepreneurs planning trans-continental communications were interested in his reports. Wm. McD. Dawson, promoter and member of the Canadian Assembly, wanted Palliser's Report to aid in estimating the cost of constructing a road for carrying mails from the headwaters

of the Saskatchewan to the Pacific.[179] The Canadian Government rejected Hind's proposal of a third season's exploration through the Rockies, on the ground that the work was already being carried out by Palliser.[180] The printed Reports were "in much request."[181] It seems that they probably had a not inconsiderable effect not only in the development of scientific knowledge, but also on the development of policy.[182]

Palliser had no doubt that settlement in his "fertile belt"[183] was possible and that "occupation of the country" would "only be a work of time." The "arid plains" of the "Triangle" were "a very different description of country." Later observers, notably Macoun, have quarrelled with this verdict and much excellent wheat has in fact been grown within the Triangle with the introduction of quickly maturing strains of wheat and improvement of dry farming methods and farm machinery. Even so, Palliser's Triangle has over the subsequent century fully justified his judgement when periodic dry spells have taken their toll in harvest failure, shortage of fodder and abandoned farms.[184]

Palliser had, with equal reason, "no hesitation in expressing" his "conviction that it is impossible for the Hudson's Bay Company to provide a government to meet the exigencies of a growing colony." He felt that while the Hudson's Bay Company could effectively govern the Indian population, "the interests of a commercial community, which at all events must be adverse to their own, would not be likely to prosper under their rule." He had put his finger on the age-old conflict between settlement and the fur trade.

He had a lively respect for the good qualities and potentialities of the Indians. In his private letter to the Secretary of State,[185] Palliser emphatically denied the alleged "incapacity and want of intellect in Indians and half-breeds, or their incapacity for instruction, and a settled life" but pointed out that this would "not come in one day, nor be produced without an effort." He suggested an ingenious scheme involving a fund for Indian education, a council to protect the interests of the Indians and supervise their education, and fur trading licences to bridge the gap between the monopoly of the Hudson's Bay Company and free trade in a settled community. Memoranda by Merivale and Stanley suggest that they paid but little attention to his presentation of the Indian problem, though humanitarian advocates of the cause of the aborigines had seized on an earlier report as ammunition.[186] Even so the Expedition made an important contribution to the peaceful solution of the very complex Indian problem. Indeed, probably one of its most constructive features was that it succeeded in penetrating the territory of warlike Indians without any serious clash.[187] The tradition of Indian friendship which the Hudson's Bay Company had nurtured within the shelter of its monopoly was, by the good relations established by this first official exploring party, strengthened and prolonged into the difficult new period in which the Indian territories began to be "opened up." Palliser understood and sympathized with the predicament with which advancing settlement threatened the Indians and half-breeds. He was sure that "The Imperial Authorities felt the duty incumbent on them of ascertaining the necessities of the People dwelling in the Indian territories and of adopting the mode of government which presents the most favourable characteristics of progression in civilization."[174] He added, "I have no hesitation in expressing my conviction that *no Government* which Canada is in the power of conferring could succeed in attaining so desirable an object."[174] The two Riel Risings in 1870 and 1885 later bore out his fears in this respect. This was one reason why he favoured establishment of a separate colony.

Another was the problem of access. He reported that the "knowledge of the country on the whole would never lead me to advocate a line of communication from Canada across the continent to the Pacific, exclusively through British territory. The time has now for ever gone by for effecting such an object, and the unfortunate choice of an astronomical boundary line has completely isolated the Central American possessions of Great Britain from Canada on the east, and also almost debarred them from any eligible access from the Pacific coast on the west." In reaching this conclusion he concurred with the Hudson's Bay Company view as to the difficulty of the Lake Superior–Red River route, which had been the great highway of the North West Company but which was now only used for official, light and express travel. It would be interesting to know how far this judgement was influenced by his association with Simpson, but in any case Palliser gave a convincing account of both the engineering, economic and political obstacles in the way of direct communication between Canada (the then Colony) and the Western Plains: "As a line of communication with the Red River and the Saskatchewan prairies, the canoe route from Lake Superior to Lake Winnipeg, even if modified and greatly improved by a large outlay of capital, would, I consider, be always too arduous and expensive a route of transport for emigrants, and never could be used for the introduction of stock, both from the broken nature of the country passed through, and also from the very small extent of available pasture. I therefore cannot recommend the Imperial Government to countenance or lend support to any scheme for constructing or, it may be said, forcing a thoroughfare by this line of route either by land or water, as there would be no immediate advantage commensurate with the required sacrifice of capital; nor can I advise such heavy expenditure as would necessarily attend the construction of any exclusively British line of road between Canada and Red River Settlement.

"As regards the fitness for settlement of the district traversed by the canoe route, I beg to state that there are only very few and isolated spots where agriculture could be carried on, and that only by the discovery of mineral wealth would this region be likely to attract settlers." To this day there is but little agriculture in the area, while mineral discoveries have indeed opened some of it up.

In his private letter he indicated, besides "the physical obstructions of no common order," further difficulties in the way of annexation to Canada: government at such a distance would be impossible and trouble with the Indians probable, while competition with the cheaper Hudson Bay route would be hopeless.[174] He thought that the people of Canada must give up "all ideas of annexation" after a study of the report of the Canadian Expedition[174] which would enable them to judge the nature of the difficulties of communicating with Red River. This conclusion was eminently reasonable at a time when even railroads in the settled areas of Canada were having serious financial problems.

Palliser was impressed, also, with the challenge of new routes from the south, as railroads pushed westward and steamboat traffic developed through U.S. territory.[188] He wrote in his final report that soon after publication of his despatch "declaring the navigability of the Red River for steamers, American enterprise established one there;" this was the *Anson Northrup* carried overland in parts by an enterprising Minnesotan and assembled on a feeder of the Red River. Simpson wrote in 1859 that ". . . through the instrumentality of the Hudson's Bay Company, steam navigation has been established on Red River,—between Fort Garry and Fort Abercrombie, connecting with stages from the latter point to St. Paul."[189] Palliser was convinced that "The egress and ingress to the settlement from the east

is obviously through the Red River valley and through the States." Soon, despite its time-honoured dependence on the Bay route, even the Hudson's Bay Company was bringing in supplies through the U.S.A.[190]

These powerful obstacles notwithstanding, Canada undertook in 1869 the formidable task of "forcing a thoroughfare" by way of the Dawson Route from Lake Superior to the Plains and by 1885 the Canadian Pacific Railway had been constructed through this difficult terrain. Palliser underestimated the strength of the Canadians' urge for "a gigantic amplification of their dominions to the shores of the Pacific. . . ."[174] He did not know Canada well enough to understand the strength of the old Nor'wester tradition of a Far West tributary to Montreal,[191] which still lived on in active rivalry with the American approach from the south, despite the temporary breaching of the trans-continental axis of the commercial empire of the St. Lawrence, by the merger in 1821 of the North West Company with the Hudson's Bay Company, which had diverted the fur trade to the competitively more effective Hudson Bay gateway to the interior.

The Expedition had established beyond any doubt the existence of a number of practicable passes through the Rocky Mountains, but had made it clear that the barriers beyond the Rockies might constitute a still more formidable obstacle than the Rockies themselves. It reported that a railway could be built through the Rocky Mountains, but only at considerable expense, and suggested development of waterways in interior British Columbia. Gold discoveries on the Fraser in late 1857 and in 1858 had given new urgency to the problem of access through the mountains.

In the end, all the seemingly insurmountable obstacles were overcome and with great cost and difficulty, as Palliser had forecast, the railway was driven through from coast to coast, using the Kicking Horse Pass through the Rocky Mountain barrier in the west. This pass had been discovered by Hector, who nearly lost his life there in a contretemps with a pack-horse. Partly in spite of, but partly because of, Palliser's Expedition, Bulwer Lytton's "visionary" dreams came true of a trans-continental railroad north of the United States Boundary.

Palliser had been concerned to establish by instrumental observations some sectors of that boundary.[192] Although, as the Foreign Office pointed out, his work in this connection being "unilateral, would not be authoritative as regards the Ud. States in deciding the Line of Boundary to the east of the Rocky Mountains," it was still considered useful in preparing the way for the official Boundary Commission's work.[193]

Further, the presence of an exploring party must have been useful in reinforcing British claims to the western territory. The Expedition's activities and the publicity they received in all probability helped to forestall American infiltration over the invisible Boundary which might have created a new situation comparable to that which led to the loss of Oregon Territory.[194] It must have strengthened the tenuous British connection provided by the Hudson's Bay Company, which in Oregon had proved too slight a link to withstand the demands of American settlement. Palliser's initiative and his arduous three years' work certainly helped to prepare the way for the new Canadian nation stretching from sea to sea, whose second Prime Minister wrote in 1876 of a proposal to confer some honour on him, that ". . . he would be glad to see him honoured, as he really performed very great services in that then new country."[195]

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[1] Royal Geographical Society, *Proceedings*, Vol. III, p. 219–22. The published material on which this article is based is as follows:

The *Proceedings* of the Royal Geographical Society:

Vol. I, pp. 208, 250, 264–7, 320–1, 460–2;
Vol. II, pp. 38–52, 146–52, 292;
Vol. III, pp. 122–7, 219–22, 317–21;
Vol. IV, pp. 35, 73–6, 169–71, 228–34, 252–3;
Vol. XX, pp. 275, 277.

Part of the material in the *Proceedings* is also printed in *The Journal of the Royal Geographical Society*:

1857, pp. clxxx–clxxxii;
1858, pp. clxxvi–clxxvii;
1859, pp. xcvii–c; cxcv–cxcix; ccii–cciii.

Despatches from the Expedition were printed in the *Journal* for 1860, pp. 267–314 as well as in a Parliamentary Paper in June 1859 listed below.

John Palliser's book, 'Solitary rambles and adventures of a hunter in the Prairies,' 1853, London, John Murray (2nd edition, 1856, 'The solitary hunter').

The reports of the Expedition which were published as Parliamentary Papers as follows:

Exploration—British North America.

'Papers relative to the Exploration by Captain Palliser of that portion of British North America which lies between the Northern Branch of the River Saskatchewan and the Frontier of the United States; and between the Red River and Rocky Mountains.'

'Presented to both Houses of Parliament by Command of Her Majesty, June, 1859.'

Exploration—British North America.

'Further Papers relative to the Exploration by the Expedition under Captain Palliser of that portion of British North America which lies between the Northern Branch of the River Saskatchewan and the Frontier of the United States; and between the Red River and the Rocky Mountains, and thence to the Pacific Ocean.'

'Presented to both Houses of Parliament by Command of Her Majesty, 1860.'

Exploration—British North America.

'The Journals, Detailed Reports, and Observations relative to the Exploration, by Captain Palliser, of that Portion of British North America, which, in Latitude, lies between the British Boundary Line and the Height of Land or Watershed of the Northern or Frozen Ocean Respectively, and in Longitude, between the Western Shore of Lake Superior and the Pacific Ocean during the Years 1857, 1858, 1859, and 1860.'

'Presented to both Houses of Parliament by Command of Her Majesty, 19th May 1863.' (The covering letter is dated 4 April 1862).

Exploration—British North America.

'Index and Maps to Captain Palliser's Reports, showing the Date of each Journey, the Route, and the Page in which it is described in the Copies of the Reports laid before Parliament on the 19th May 1863.'

'Presented to both Houses of Parliament by Command of Her Majesty.'

(*London: Printed by George Edward Eyre and William Spottiswoode, Printers to the Queen's Most Excellent Majesty. For Her Majesty's Stationery Office*, 1859, 1860, 1863 *and* 1865.)

These reports are hereafter referred to as *Reports*, 1859, 1860, 1863 and 1865.

Note: References to and quotations from all the above are not identified individually in the footnotes.

I have also used a letter from Palliser to his father dated Fort Garry, 17 July 1857, published in *The Beaver*, December 1938, p. 39–41; The 'Dictionary of National Biography'; An obituary in the London *Times*, 29 August 1887, p. 6; A letter from Richard Hardisty, Carlton House, Sask., to Wm. McMurray at Fort Alexander, Man., published in part in Allan R. Turner's "Palliser of the Triangle," *The Beaver*, Autumn 1957, p. 9; and Burke's 'Landed Gentry of Ireland,' 1912, p. 548–9, and 'Landed Gentry of Great Britain,' 1921, pp. 1523 and 1863, p. 451.

Palliser's personal papers seem to have been destroyed in the fire which burnt down Comeragh House in February, 1923. This article is based on documents in the Archives of the Royal Geographical Society; in the Public Record Office, London (chiefly in the C.O.6 series); in the Archives of the Hudson's Bay Company; in libraries and offices in Dublin; in the possession of Mr. Ian Fairholme, whose father, Captain Edward Fairholme, inherited the Comeragh Property from Palliser's niece, Miss Caroline Fairholme; and in the books of Trinity College, Dublin; on transcripts of two letters from the Hector Papers at the Hocken Library, University of Otago, New Zealand (microfilm in the Saskatchewan Archives); and on information given me by word of mouth and personal correspondence by Major John Gray of Comeragh House, Mr. Wray Galloway of Annestown, Co. Waterford, Mr. Arthur Hunt of Rockmount, Mr. Charles Langley of Tay Lodge, both of Kilmacthomas, Co. Waterford, Mr. Power of Mahon Bridge, Co. Waterford, and many other friends and connections of the Palliser family.

The writer acknowledges with much gratitude the privilege of access to all these documents together with the generous help and kindness of the Director and staff of the R.G.S.; of the staff of the Library of the Commonwealth Relations Office; of the staff of the Public Record Office and of the Chief of the London Office of the Public Archives of Canada and her staff; of the Governor and Committee of the Hudson's Bay Company in giving permission for the publication of the quotations in this article from material in the Company's Archives, and of the help of the Company's Archivist and her staff; of Professor Otway-Ruthven and Dr. McDowell, Fellow and Tutor, both of Trinity College, Dublin; the staff of the Public Record Office of Ireland; the Chief Herald, The Genealogical Office, Dublin; and the many other scholars and officials in that city who have given her assistance; of the Librarian of the Royal Commonwealth Society and his staff; of Mr. and Mrs. Ian Fairholme, Mr. Wray Galloway, and others connected with the Palliser family; of Major John Gray, the present owner of Comeragh House and other kind residents of Co. Waterford; of members of the Blakiston family; and of many others who have helped with information and advice.

By way of celebrating the centenary of Palliser's Expedition the Archives of the Province of Saskatchewan initiated the enquiries which have led to this article being written. For a fuller account of the search for Palliser's papers see *Saskatchewan History*, "On the trail of Palliser's papers," Spring, 1959, XII, No. 2.

[2] An agreement was signed on 25 July 1958 between the Federal and Provincial (Saskatchewan) governments under which this project is now being carried out.

[3] The D.N.B. gives the year of John Palliser's birth as 1807, but his parents' marriage settlement (Public Record Office of Ireland) is dated 7 November 1814; the notice in the *Irish Times* for 22 August 1887, p. 1, of his death on 18 August 1887 gave his age as 70; and the Parish Register at Kilrossanty is reported to give 70 as his age when he died. When he set out in command of his exploring Expedition he was therefore 40, not 50, as has been supposed. The crucial dates in his career make an interesting pattern.

	Born 1817
Set out on his first American trip	.. 1847
Set out in command of B.N.A. Expedition	.. 1857
Awarded C.M.G. in recognition of services as its leader	.. 1877
	Died 1887

[4] Burke, 'Landed Gentry of Ireland,' 1912, p. 548–9.

[5] D.N.B.

[6] 'Landed Gentry of Ireland,' *op. cit.* and D.N.B.

[7] The will (dated 21 November 1831) of John Palliser of Derryluskan (1760–1833), the explorer's grandfather, indicates the extent of the Palliser property by the early nineteenth century, as does the marriage settlement of Wray Palliser and Anne Gledstanes, dated 7 November 1814 (both in the P.R.O. of Ireland). From the middle of the nineteenth century the property dwindled. It was heavily mortgaged and gradually sold off, and serious financial difficulties apparently beset Palliser after his return from British North America.

[8] Marriage settlement, *op. cit.* The entail was subsequently broken by a deed of disentailment shortly before the marriage of John Palliser's older sister Grace to William Fairholme in 1853. Some time before Palliser's death the estates were settled on his niece, Miss Caroline Fairholme. I am indebted for this information to Mr. Charles Langley, Tay Lodge, Kilmacthomas, Co. Waterford.

[9] Street directories for 1831 and 1850 for Dublin consulted at the P.R.O. of Ireland and references in John Palliser's grandfather's will, *op. cit.*

[10] His will, 21 November 1833, *op. cit.*

[11] I am indebted for this information to Mr. Arthur Hunt of Rockmount, Kilmacthomas, Co. Waterford, who as a boy knew John Palliser personally, and whose grandfather built the original Roxborough House. An indenture dated 1816 at the P.R.O. of Ireland refers to "Wray Palliser of Comragh Lodge."

[12] This letter was transcribed for me by the kindness of Mr. Francis Thompson, Librarian and Keeper of the Devonshire Collections at Chatsworth House.

[13] 'Landed Gentry of Ireland,' pp. 548–9.

[14] *Ibid.* and reference in marriage settlement of Wray Palliser and Anne Gledstanes, *op. cit.*

[15] For example, *Reports*, 1863, p. 135: "June 12th, Sunday—Read the prayers of the Church of England, Ballenden translating the most important ones into Cree, also first and second lessons."

[16] Wills of Grace Everina Palliser, died 2 April 1864, and of Anna Palliser, died 6 September 1864, both in P.R.O. of Ireland.

[17] 'Landed Gentry of Ireland,' pp. 548–9.

[18] 'Solitary rambles' and letters in the Hudson's Bay Company Archives from Palliser to Sir George Simpson make this clear.

[19] 'Landed Gentry of Ireland,' Thom's Irish Almanack, and 'The Establishments of Ireland,' Part III, Official and Supplementary Lists.

[20] *Record of Officers' Services*, W.O.68/96 P.R.O. London.

[21] Transcript from College Books sent me by the kindness of Dr. R. B. McDowell, Ph.D., Fellow and Tutor, Trinity College, Dublin, and Sadleir, 'Alumni Dublinenses'. John Palliser was entered at T.C.D. in 1834 on 1 July (rather amusingly—as 1 July has become Canada Day). He began his Junior Freshman year in the Hilary Term, 1835.

[22] *Militia Muster Rolls*, Waterford Artillery Militia, 14 January to 31 March 1855, P.R.O., London.

[23] William Fairholme to Murchison from Comragh House, 3 December 1857, C.O.6/23 "M". The Indian Mutiny precipitated a general mobilization of armed forces in 1857.

[24] *Muster Rolls, op. cit.*: 7 May 1862 to 10 June 1862, Palliser was on service; 8 June 1863 to 28 June 1863, he was listed as "Absent without leave." His final report was presented to Parliament on 19 May 1863, so it is possible that he was in London in June in this connection.

[25] *Record of Officers' Services, op. cit.* and *Militia Muster Rolls*, Waterford Artillery Militia, 25 May to 28 June 1864, P.R.O. London.

[26] William Fairholme, *op. cit.*, wrote in his letter of 3 December 1857, that it was

"to the county political interest of Lord Stuart to get both the Colonel [Wray Palliser] and his son out of the Regt." *The Record of Officers' Services* list of succession shows that Wm. Villiers Stuart succeeded Colonel Wray Palliser on 26 December 1862.

[27] Obituary, *London Times*, 29 August 1887.

[28] Obituary, *op. cit.*, and 'Landed Gentry of Ireland,' *op. cit.*

[29] Printed Rentals, Nos. 406 to 434, Volume 33, Quit Rent Office, P.R.O. of Ireland, 14 February 1862, Wray Palliser's estate, Co. Longford: "The tenantry are industrious and comfortable; they have much benefitted by the large expenditure made by Colonel Palliser in thorough and main draining (which was chiefly at his own cost)."

[30] D.N.B.

[31] He is frequently mentioned by Sir Samuel W. Baker in 'Eight years in Ceylon,' and twice by Wm. Fairholme in his letters from Ceylon, which I have read through the kindness of Mr. Ian Fairholme. Mr. S. Guinness kindly informed me of the Norwegian connection. I am indebted to Mrs. Middleton, assistant editor of this *Journal*, for drawing my attention to the connection with Sir Samuel W. Baker.

[32] D.N.B., the entry for Sir William Palliser (1830–1882) mentions this episode at the end.

[33] 'Landed Gentry of Ireland;' Hart's *Army List*; Sir Samuel W. Baker 'The rifle and hound in Ceylon;' Department of Militia and Defence of the Dominion of Canada, 'Report upon the suppression of the rebellion in the North West Territories and matters in connection therewith, in 1885,' Ottawa, 1886, p. 11.

[34] D.N.B., 'Landed Gentry of Ireland,' *op. cit.*, and information kindly communicated to me by Sir William Palliser's grandson, Mr. Wray Galloway of Annestown, Co. Waterford.

[35] Extracts from a letter written in Montreal, 16 September 1838, and from his 'Journal kept during an Expedition to the Grand Prairies of the Missouri,' 9 August to 21 November 1840 which Mr. Ian Fairholme has most kindly made available to me. William Fairholme's vivid description of a prairie fire was quoted by John Palliser in his own book, 'Solitary rambles', pp. 90–95, with acknowledgments to an anonymous "brother sportsman." A Lieutenant Warre, presumably the Warre who in 1845 was sent overland on a special mission to the Oregon Territory, and who was in Canada in 1840 (*Muster Rolls*, 14th Regiment), was a member of William Fairholme's Missouri party.

[36] Sir George Simpson to Palliser, 14 April 1858, H.B.Co. Archives, D4/84a, folio 658.

[37] Extracts from William Fairholme's letters from Ceylon, written between 23 November 1845 and 9 May 1851, were made available to me by Mr. Ian Fairholme.

[38] G. K. E. Fairholme, F.R.G.S., 'Sketch of the aboriginal inhabitants of New South Wales,' Tulburra, Moreton, N.S.W., 1844, in Mr. Ian Fairholme's possession.

[39] Lieutenant James W. Fairholme. Mr. Ian Fairholme has in his possession his last letter written from H.M.S. *Erebus* on 1 July 1845, "Just inside the Arctic O [*sic*]."

[40] 'Landed Gentry of Great Britain,' 1921, p. 1523.

[41] R.G.S. Archives, Palliser Block. He sat next Livingstone at the first meeting he attended as a Fellow of the Society on 12 January 1857 (*Proceedings*, Vol. I, p. 266). H. C. Patterson (*The Beaver*, March 1837, p. 49) states that Palliser was made a F.R.G.S. after his return from British North America, but the *Proceedings* (Vol. I, p. 208) make it clear that he was elected on 24 November 1856, and was "officially introduced" upon his election on 12 January 1857 (p. 250). This is confirmed by the Minutes of Council. His projected exploration was first publicly mentioned at this meeting in the discussion following a paper by Thos. Banister urging the construction of a railroad across British North America (*Proceedings*, Vol. I, pp. 264–267). The Expedition later named a range of mountains in the Cordilleras after Livingstone.

[42] I am indebted to Mrs. Middleton, assistant editor of this *Journal*, for the comparison.

[43] The introduction to his final report makes this conviction clear (*Reports*, 186 3

p. 4), while the R.G.S. letter of 13 January 1857, proposing the Expedition, which was no doubt inspired by Palliser (C.O.6/22 "Miscellaneous Offices"), stresses the urgency of emulating American and Russian activity in western exploration.

[44] 'Solitary rambles,' p. 316. Captain Ringgold had been a member of the United States Exploring Expedition commanded by Charles Wilkes, U.S.N., 1838–42. 'Narrative,' London, Wiley & Putman, 1845.

[45] D.N.B.

[46] R.G.S. *Council Minutes*, p. 181.

[47] An editorial in the Toronto *Weekly Globe* for 16 April 1858 states "we know that influential and well-informed men have been, for some years past, pressing upon the Imperial Government the importance of taking steps to rival the Americans in their Pacific Railway project, and the expedition of Mr. Palliser was undoubtedly the fruit of the labours of these parties . . ." C.O.6/28 "F".

[48] For illuminating studies of the background and nature of this crisis see Galbraith, John S., 'The Hudson's Bay Company as an Imperial factor, 1821–1869,' University of California Press, 1957; Morton, W. L. 'The West and Confederation 1857–1871,' Canadian Historical Association, Historical Booklet No. 9, Ottawa, 1958, and A. S. Morton's great work 'A history of the Canadian West to 1870–71,' Nelson, Toronto & New York, n.d.

[49] The Rev. Mr. Nicolay, F.R.G.S., stated 12 January 1857 at the R.G.S. meeting that "The Canadians began to feel cooped up, and wanted a way to the west . . ." *Proceedings*, Vol. I, p. 265.

[50] This comprised Rupert's Land, the enormous territory draining to Hudson Bay which was held by the Company under its Charter of 1670; and the rest of western British North America which came under its sway by the terms of a license giving it a monopoly of trade west of Rupert's Land which was granted in 1821 and renewed in 1838 for a further twenty-one years.

[51] Sir George Simpson (H.B.Co. Archives, D4/76a, folio 208), 6 January 1857, ". . . I have now to report that reliable information has reached me of the determination of the United States Government to form a Garrison at Pembina, close to the Boundary Line, and adjoining the Settlement, in the course of next summer; arrangements, to that end, having commenced last Autumn." Copy in the P.R.O., C.O.6/22 "War Office." See also Simpson to Smith, 20 October 1856 (D4/76a, folio 505), reporting "the arrival at Pembina of a detachment of 100 U.S troops".

[52] See Galbraith, *op. cit.*

[53] In 'Solitary rambles' Palliser writes of his experiences on the "White" river. At a meeting of the R.G.S. on 12 January 1857 (*Proceedings*, Vol. I, p. 266) he spoke of crossing into British territory on the "White-earth" river. This river does not in fact seem to flow from north of the 49th parallel, though the early maps showed it as doing so—a characteristic case of uncertainty about the boundary. The Expedition map correctly showed the Milk River to the north of 49° while the earlier maps had it entirely to the south of 49° N.

[54] Report of Exploration and Survey to ascertain the most practicable and economic Route for a Railroad from the Mississippi River to the Pacific Ocean, made under direction of the Secretary of State for War, in 1853–6 (Washington 1856–60) being United States *Executive Documents*, 33rd Congress, 2nd Session, No. 78, 12 Vols.

[55] Thos. Banister's proposal was only one of many that contemplated the construction of a railroad through British North America. Some, like this one, proposed the construction of a railroad from Canada exclusively through British territory, others from St. Paul, Minnesota, in the U.S.A., north into British territory and so across the Plains north of the Great American Desert to the Rockies and through passes believed to exist north of the 49th parallel. There are many documents concerning such projects in the C.O.6 series at the Public Record Office.

[56] Earl Grey, 16 September 1846, as quoted by Galbraith, *op. cit.*, p. 283.

[57] Hudson's Bay Company Archives, D4/76a, folio 432–1. He added ". . . which is,

however, of little consequence, as the Southern boundary of the Company's territory is in that part defined by Treaty."

[58] On 14 February 1859, reported in the *Illustrated London News*, 19 February 1859, p. 190.

[59] 26 August 1859, Lachine, Hudson's Bay Company Archives, D4/79, folio 795–4.

[60] Tyrrell, J. B. (ed.), 'David Thompson's narrative of his explorations in Western America, 1784–1812,' Toronto, The Champlain Society, 1916, pp. lv and lvi.

[61] Turnor explored part of the North Saskatchewan and northwards to Lake Athabasca. His 'Journals' (edited by J. B. Tyrrell) were first published in 1934 by the Champlain Society, though his 'Results of astronomical observations, made in the interior parts of North America' were printed for Arrowsmith in London in 1794 (see Peel, Bruce, B., 'A bibliography of the Prairie Provinces to 1953,' University of Toronto Press, 1956, p. 7); David Thompson's 'Narrative of his explorations in Western America, 1784–1812' (also edited by J. B. Tyrrell) was published by the Champlain Society in 1916, but his journal, replete with minute scientific detail and mathematical calculations, has never been published, though Elliott Coues used it exhaustively in 1897 in editing the younger Alexander Henry's journal in 'New light on the early history of the greater North-west,' (New York, Francis P. Harper, 1897). According to Simpson, Thompson's papers were offered for sale to the Hudson's Bay Company and to the English and Canadian Governments and were, he presumed, still in the hands of his family, 20 August 1859 (H.B.Co. Archives, D4/84a, folio 260). Hind, however, wrote that his data for those parts of the country he did not visit were "derived chiefly from the large manuscript Map of the North-West in the Crown Lands Office, by the late excellent but neglected geographer David Thompson . . ." 'North-west Territory, Reports of Progress; Together with a Preliminary and General Report on the Assiniboine and Saskatchewan Exploring Expedition, Made under Instructions From the Provincial Secretary, Canada,' Toronto, 1859, p. vi. Little has yet been published concerning Fidler's explorations in the southern prairies. The journal of his exploration of Slave Lake and Slave River in the north in 1791–2 were printed in J. B. Tyrrell (ed.), 'Journals of Samuel Hearne and Philip Turnor' (Toronto, 1934). See also Tyrrell, "Peter Fidler, Trader and Surveyor," *Trans., Royal Society*, Canada, 1913. Peel's historical bibliography, cited above, indicates how sparse other published material was at the time.

[62] Correspondence in the Hudson's Bay Company Archives makes this clear, A5/9, folio 148 (p. 264). Simpson wrote from Lachine on 11 February 1860, to the Secretary of the Smithsonian Institute: "You can, however, procure the best map extant of that region from Mr. Arrowsmith, Hydrographer, of Soho, London, who works for the Hudson's Bay Company, by whom he is regularly supplied with every chart or journal they receive from their officers, which Mr. Arrowsmith incorporates in his charts; so that they are kept up from year to year to the latest point of discoveries and surveys in the Arctic seas and elsewhere." H.B.Co. Archives, D4/79, folio 326.

[63] London, Henry Colburn, 1847, Vol. I, pp. 79–148.

[64] Simpson to "Bear" Ellice, 19 March 1859 (H.B.Co. Archives, D4/84a, folio 344) with reference to a report of the meeting of the R.G.S. on 14 February 1859, which he has "lately noticed in the *Illustrated London News* . . .".

[65] Murchison to Secretary of State for the Colonies, 13 January 1857, C.O.6/22 "Miscellaneous Offices."

[66] When Murchison's Presidential Address of 23 May 1859 was printed a footnote was added (*Proceedings*, Vol. III, pp. 319–20) to explain that he "was recently informed" by Ellice of Thompson's work, and that he had "further learnt from Mr. Arrowsmith" more about it and about the "great map" Thompson "had projected."

[67] His name is listed among those present at the Council meeting on 8 December 1856 (R.G.S. *Council Minute Book*, p. 179), and at the meeting of the Expedition Committee on 18 December 1856 (*Committee Minute Book*, p. 121). Tyrrell points out (*op. cit.*, pp. lxii–lxiii) that nowhere on the Arrowsmith maps is there any

acknowledgement of Thompson's work. Professor Monica Wilson has suggested to me that Arrowsmith's silence may well have been prompted by a desire to secure an entirely independent check on earlier information. He may also have been doubtful as to how far he was free to reveal Company information as to his sources.

[68] Even Rae said nothing about earlier exploration when the project was first mooted in public. He wrote to Norton Shaw, of the R.G.S. meeting on 12 January 1857: "I would have spoken tonight on the railway question but as people might think my word worth nothing as I may be considered a party interested I kept quiet" (R.G.S. Archives, Rae, Dr. John, Block). Even in this letter he made no mention of earlier discoveries, confining his comment to Hudson's Bay Company freight charges and to support of Lefroy's opinion that a railway would be commercially impossible though physically possible.

[69] Blakiston was magnetic observer to the Expedition. Of the travellers he lists, few had, however, published their findings by 1856. Those who had done so, notably Mackenzie and Franklin, had explored the fur trade route by the North Saskatchewan and the country to the north, or like Simpson had written in a general descriptive vein. See Peel, *op. cit.* Kane's 'Wanderings of an artist,' for example, was first published in 1859. Palliser's expedition prompted a belated recognition of the value of earlier work which had been virtually unknown a few years before when he proposed the exploration.

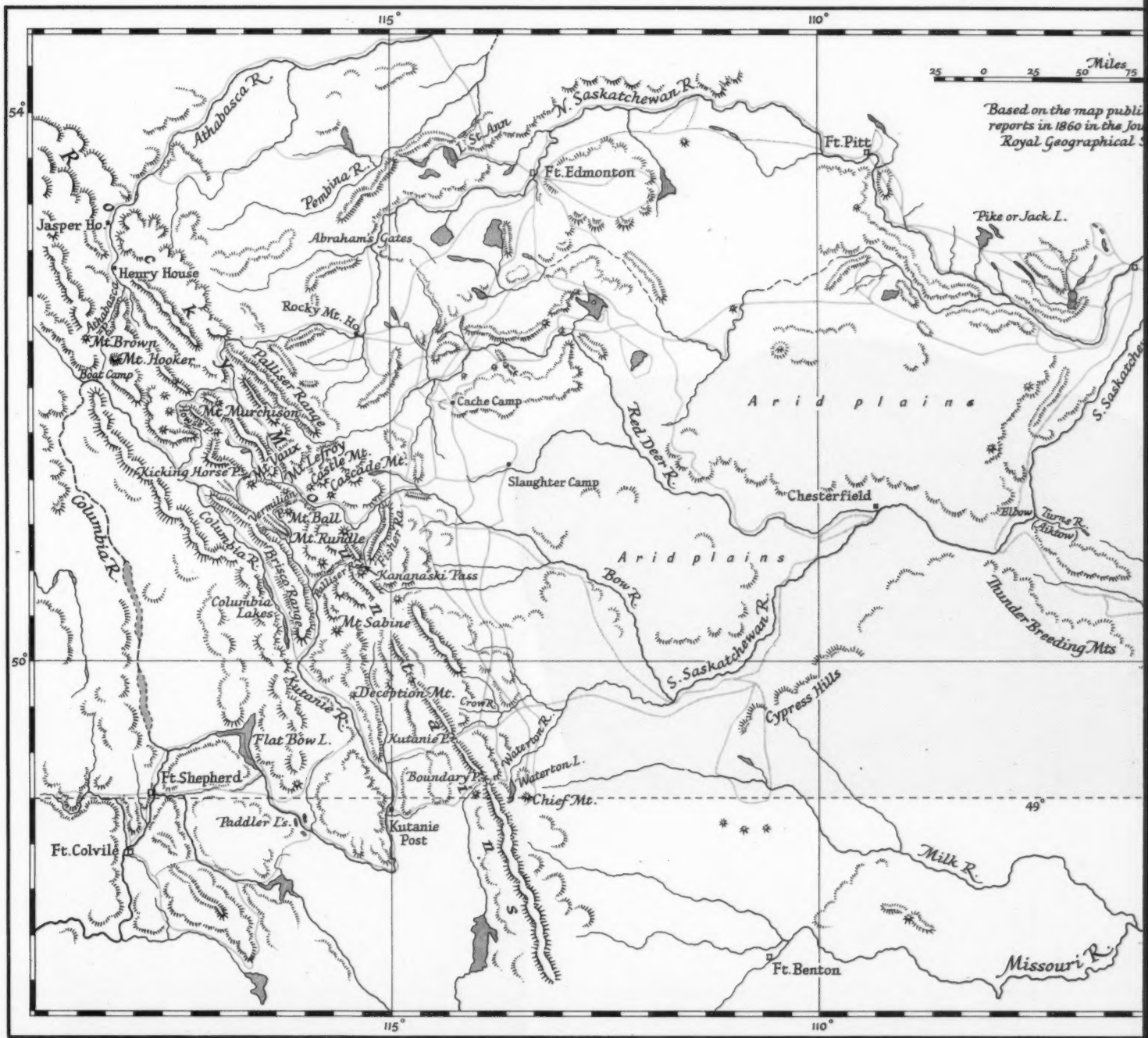
[70] *Reports*, 1860, p. 69, "a few steps further and I gave a loud shout [in the MS. C.O.6/31 "B", 'a wild shout'] as I caught the first glimpse in a deep valley, as it were at my feet, of a feeder of the Pacific Ocean. . . . At the same moment the shots of my men's guns echoing among the rocks announced the passage of the first white man over the Kootanie Pass." There is still disagreement as to who went over which passes first. It may be that he was the first white man "over the Kootanie Pass," though it seems likely that James Sinclair, an educated half-breed, may have taken this route with at least one of the two parties of emigrants he conducted across the continent from Red River to Oregon. Chief Trader James McMillan, seems to have been familiar with at least one of the Kootenay passes. He had been associated with Thompson in 1809. He apparently suggested to Simpson in November 1824 that it would save a month to use the "Coutonais Portage" instead of the Athabasca portage route to the posts of the Columbia. Merk, Frederick, 'Fur trade and Empire,' Harvard University Press, 1931, pp. 67–8, 41, 243. Simpson wrote: "I was informed by Captain Blakiston, R. A. (a member of the expedition) that the pass about the discovery of which so much has been said, is that known to us as the 'Kootonais', or 'Sinclair's' pass. It [*sic*] is that followed by the party of Red River emigrants who, in 1841, were forwarded by the Company to Puget Sound, under the charge of the late Mr. James Sinclair" (26 August 1859, H.B.Co. Archives, D4/79, folio 794). This does not seem to agree with Blakiston's report. Rather it substantiates Palliser's version and gives the background of his desire to discover whether this pass was north of 49°.

[71] Black's 'Atlas of North America,' Edinburgh, Adam and Charles Black, MDCCCLVI. A minute dated 15 April 1857, on a letter from the Foreign Office, shows that the Colonial Office used this atlas (C.O.6/22 "Foreign Office").

[72] Galbraith, *op. cit.*, p. 39.

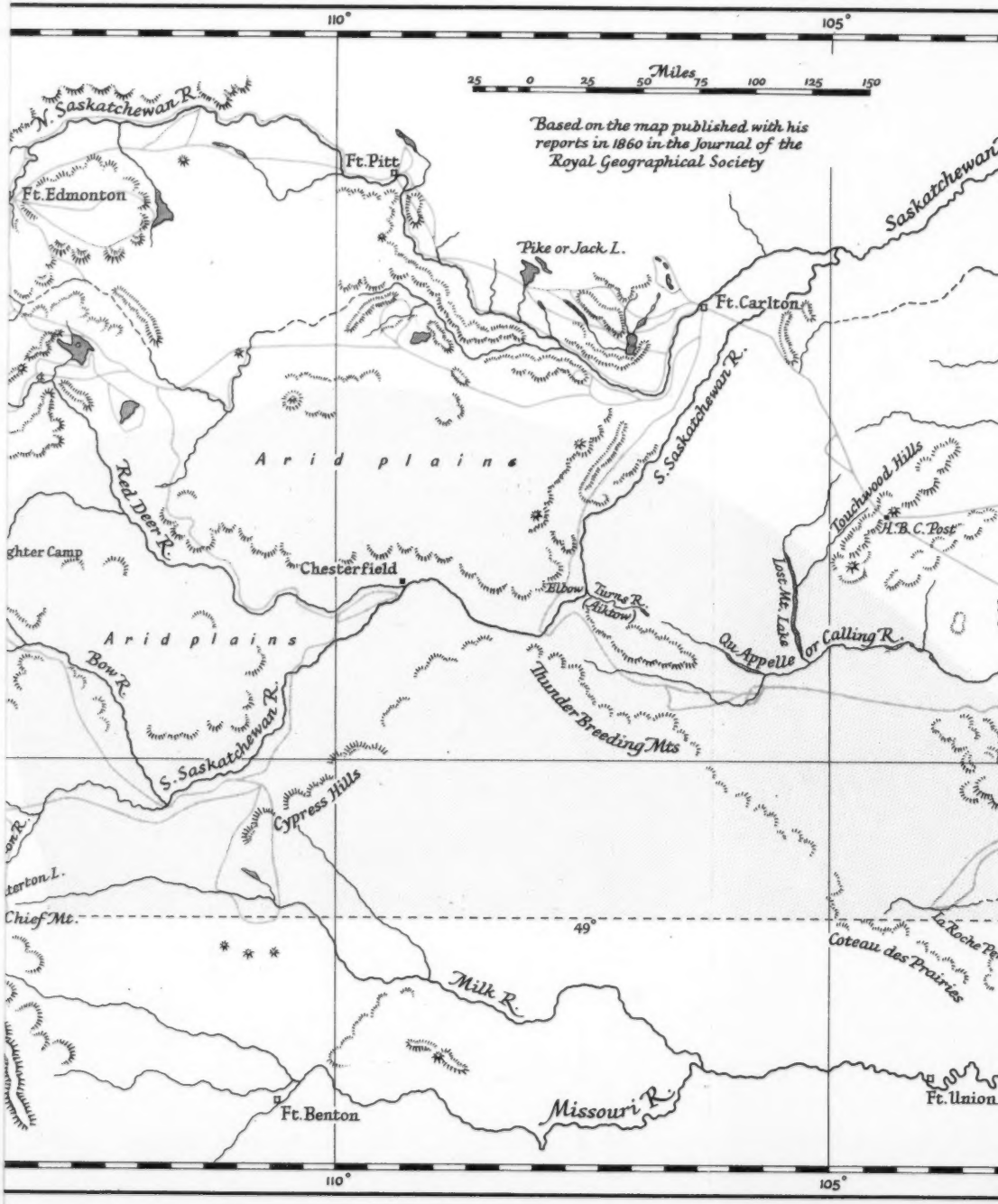
[73] In the Hudson's Bay Archives there are many requests for help in connection with scientific inquiries, *e.g.* from the Smithsonian Institute, to which the response was generous and helpful. Not many of its officers, of course, were competent to make scientific observations on their own account. Simpson wrote to William Cowan, Esq., M.D., at Moose-factory, 28 April 1860, with reference to the "stir" "in the scientific world" over the impending total eclipse: "Perhaps, for the credit of the concern, you will endeavour to make some accurate observations, as few of our people having [*sic*] a sufficient smattering of science for such purpose" (H.B.Co. Archives, D4/79, folios 174–3). Several officers of the Company, however, kept meteorological records for Palliser's expedition.

Routes of Capt. John Palliser's expedition from the Red Riv

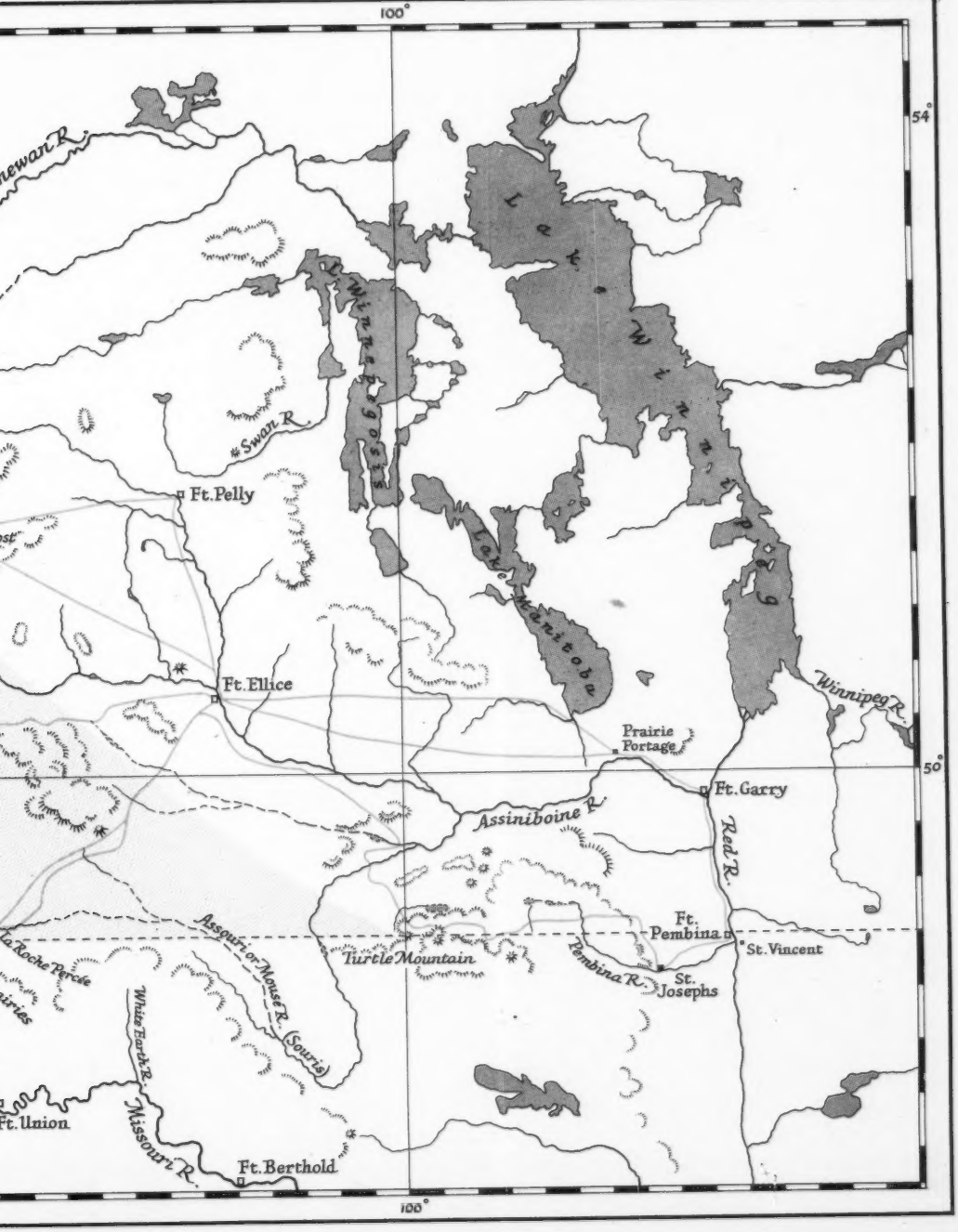


Published by the Royal Geographical Society

f Capt. John Palliser's expedition from the Red River to the Columbia Ri



a River between 1857 and 1859



[74] Simpson to Rae, 20 August 1859, H.B.Co. Archives, D4/84a, folio 261–0.

[75] Simpson to Ellice, 23 September 1859, H.B.Co. Archives, D4/84a, folios 256–7.

[76] The original letter from the Colonial Office to the Treasury states that the "information respecting it, hitherto possessed is extremely scanty, and rests for the most part on imperfect authority," 22 January 1857, C.O.6/22 "Miscellaneous Offices."

[77] 'Report from the Select Committee on the Hudson's Bay Company; together with the proceedings of the Committee, Minutes of Evidence, Appendix and Index. Ordered, by the House of Commons, to be printed, 31 July and 11 August 1857.' Compare Morton, W. L., *op. cit.*, p. 9.

[78] Canada, Legislative Assembly, 'Report on the exploration of the country between Lake Superior and the Red River Settlement,' Toronto, 1858; Dawson, S. J., 'Report on the exploration of the country between Lake Superior and the Red River Settlement, and between the latter place and the Assiniboine and Saskatchewan,' Toronto, 1859; and Hind, H. Y., 'North West Territory, Reports of Progress', *op. cit.*, Toronto, 1859.

[80] Minutes of Expedition Committee, 18 December 1856, *Committee Minute Book*, pp. 121–2.

[81] C.O.6/22 "Miscellaneous Offices." There are frequent references in the correspondence to a letter dated 6 January 1857 but the letter in C.O.6/22 is dated January 13. The copy in the R.G.S. *Letter Book*, 1857, p. 245, is dated January 6 but the covering minute stating that this letter is being sent to Murchison for signature is dated January 13.

[82] Horses had been, in fact, regularly used on this pass, difficult as this was. See Merk, Frederick, 'Fur trade and Empire,' Cambridge Press, 1931, p. 31–36, for Simpson's account of his crossing in 1824.

[83] Memoranda re the R.G.S. letter of 13 January 1857. C.O.6/22 "Miscellaneous Offices." An entry in the R.G.S. *Letter Book*, 1850–1859, p. 256, reads: "*Palliser, John:* Returning by his request his paper on the proposed Expedition to North America, to take to the Colonial Office to Mr. Ball.—" 4 March 1857.

[84] D.N.B.

[85] C.O. 6/23 "P."

[86] Ball to Palliser, 4 March 1857, C.O.6/22 "Treasury."

[87] There had been long discussion about the determination of the Boundary under the terms of the Treaty of 1846 and Merivale had pointed out that it would be well to mark the Boundary along the 49th Parallel from the Straits of Georgia to the Rockies and that it might be desirable to "run the line" right to the Lake of the Woods and beyond it to Lake Superior. In the end the Rocky Mountains–Lake of the Woods sector of the Boundary was not "run" until 1872–4. Captain (later Colonel) Hawkins, R.E., who was finally appointed to command the official British party to work with the U.S. Boundary Commissioners in surveying the land boundary from the Straits of Georgia to the Rockies, arrived at Esquimalt, Vancouver Island, on 12 July 1858, C.O.6/25 "Foreign Office."

[88] Murchison to Ball, 21 March 1857, C.O.6/22 "Treasury." The draft of this letter (heavily amended) is in R.G.S. Archives, Murchison Block.

[89] This decision is given in the final note on the R.G.S. letter of 13 January 1857. The Colonial Office wrote to the Treasury accordingly on January 22, C.O.6/22 "Miscellaneous Offices."

[90] Wilson (Treasury) to Merivale, 23 March 1857, C.O.6/22, "Treasury" and Merivale to Murchison, 1 April 1857, C.O.6/22 "Miscellaneous Offices."

[91] Ball to Lord Wrottesley, President of the Royal Society, asking for his advice and that of Sabine, and suggesting an early meeting of scientists, 6 March 1857, C.O.6/22 "Treasury."

[92] Wrottesley to Ball, March 18, enclosing "our Palliser Commie" minutes, of 16 March 1857, C.O.6/22 "Treasury."

[93] A letter from Blakiston dated 21 January 1857 asks Murchison to recommend

him (R.G.S. Archives, Blakiston Block). The other facts as to personnel, instruments, etc., are from the Minutes of the meeting of 16 March 1857 corroborated by correspondence in the R.G.S. Archives and elsewhere in the C.O.6 series.

[94] Sir William Hooker to Labouchere, January 21, and Hooker to Ball 27 March 1857 (C.O.6/22 "Miscellaneous Offices") and Ball to Hooker, 6 March, and Hooker to Ball, 8 March 1857, both C.O.6/22 "Treasury."

[95] Murchison from Museum of Practical Geology, dated 31 March 1857, to Ball, C.O.6/22, "Miscellaneous Offices."

[96] Palliser to the Colonial Secretary, 5 June 1858, C.O.6/29 "P." The Expedition named the Purcell Mountains in southern B.C.

[97] Minutes of 16 March 1857, C.O.6/22 "Treasury." These minutes show that among other scientists, Darwin had been consulted as to the "scientific objects" of the Expedition. Blakiston's instructions were sent to the Colonial Office by the Secretary of the Royal Society on 20 June 1857 (C.O.6/22 "Miscellaneous Offices"). As Palliser had by then left England, he presumably had not seen them. This, no doubt, partly explains why he did not leave directions as to what help Blakiston was to be given by the other members of the Expedition in carrying them out, probably a factor in the difficult situation which led to Blakiston's "separation" from the Expedition on 11 August 1858. See *Reports*, 1860, p. 31, and Palliser's letter to Newcastle, 20 November 1860, C.O.6/32 "P."

[98] Palliser listed the authorities he had consulted in answering (5 March 1857) Ball's inquiries as to routes, travel possibilities, etc., as "Sir Geo. Simpson, Doctor Rae, young Miles, and Mr. McTavish all of the H.B.C[y]." There is a long letter of advice from Richardson, 6 March 1857, in response to an inquiry by Sir Wm. Hooker. He suggests that Simpson should be consulted. (All in C.O.6/22 "Treasury.")

[99] C.O.6/23 "Treasury."

[100] Ball had stressed Palliser's "independent position" (p. 156 above) and Palliser himself emphasized this as one reason for his private letter of 13 March 1858 from Montreal to the Secretary of State, offering as to political questions "a few remarks and suggestions valuable only perhaps because coming from an impartial observer like myself." He pointed out that he was "able to exercise on this subject [the future of the Indians and half-breeds] a judgement unbiased by favour or prejudice—for I am one of the few that have ever traversed the country who have not either been in the interests of, or at variance to the Hudson Bay Company [*sic*]" (C.O.6/29 "P").

[101] On the Missouri River, at the site of the contemporary Kansas City.

[102] To Dallas, 16 January 1860, H.B.Co. Archives, D4/84a, folio 193, and to Ellice, 23 September 1859: ". . . he is a very good fellow but ignorant of business and timid about being censured for the outlays on his Expedition which may induce him to shirk his liability." D4/84a, folio 257 . . . Palliser did not in fact attempt to get out of responsibility for the Hudson's Bay Company bills, though these seem to have been larger than he had expected.

[103] There is a prolonged correspondence in the C.O.6 series over the bills, which had to go from remote posts in the interior to Montreal to be priced under Sir George Simpson's supervision, and which then had to be authenticated by Palliser, who had meanwhile moved on to still more distant points. Not unnaturally there was confusion and uncertainty about how much had been spent. In the end the expenditures totalled some £13,000 as compared with the original Parliamentary vote of £5000, after the time to be spent on the exploration had twice been extended and two supplementary votes authorized, and after a number of unforeseen and inflated costs had been incurred as a result of such contingencies as the additional exploration from Lake Superior to Red River; the shortage of buffalo; and enhanced prices due to the gold rush on the Fraser River.

[104] Hector to Palliser from Fort Carlton, 1 May 1858, microfilm in Saskatchewan Archives of Hector Papers at the Hocken Library, University of Otago, New Zealand.

[105] ". . . you are aware that he has produced no tangible reports or records; but two younger men who were attached to him are now employed upon a work which it is hoped will prove useful." 7 February 1861. See also Elliot's minute of 20 December 1860 about Palliser's request of 13 December 1860, that a year's salary should be paid to Hector and Sullivan while engaged on this work, which was the Report of 1863. (Both C.O.6/32 "P".) Numerous emendations by Palliser in the MS. copy (C.O.6/37) show that he took at least a heavy share of editorial responsibility.

[106] For example, H. S. Patterson, K.C., states in "On the trail of Palliser," *The Beaver*, March 1937, pp. 49–54 and 66, that it is impossible to identify Palliser's route through the Rockies from his description, though Hector's exact descriptions make precise identification of his route easy.

[107] Simpson from Lachine, 1 June 1860, to Berens, H.B.Co. Archives, D4/84a, folio 52.

[108] C.O.6/29 "P."

[109] *Reports*, 1863, p. 134. Even in this case his agreement was no doubt prompted by his need of Brisco's help. Brisco might possibly have refused to accompany the party without this favourite hunter.

[110] Hector to Palliser from Fort Carlton, 1 May 1858, microfilm of Hector Papers, Hocken Library, *op. cit.*

[111] H.B.Co. Archives, Palliser to Simpson from "Saulk" Rapids, Minnesota, 29 March [1858], H.B.Co. Archives, D5/46 1858 (1), folio 314.

[112] To Dallas, 13 January 1860. H.B.Co. Archives, D4/84a, folio 193.

[113] H.B.Co. Archives, D4/77 1857–8, folio 353–2.

[114] Palliser to Simpson from Fort Edmonton, 7 January 1859, H.B.Co. Archives, D5/48 1859 (1), folio 39.

[115] H.B.Co. Archives, D5/46, folio 173.

[116] H.B.Co. Archives, D5/47 1858 (2), folio 412. This sociability and appreciation of good cheer is evident also in many passages in 'Solitary rambles.'

[117] *Reports*, 1859, p. 40, and *Reports*, 1860, pp. 31 and 33. The Governor of the Hudson's Bay Company sent on 19 October 1859 to the Colonial Office an excerpt from a letter from Simpson dated 21 June 1859: "By our advices from the Saskatchewan we learn that Captain Palliser's Expedition has fallen to pieces, in consequence of a want of union among the Officers attached to it. You are already aware that Cap^{tn} Blakiston R.A., who had charge of the magnetical department, had some difference of opinion with Captain Palliser relative to their respective authority, which led to his detaching himself from that Gentleman's command and proceeding to England. He declined to deliver up his observations to his superior Officer, and it is his intention to make a distinct and independent report on his branch of the Expedition. Mr. Bourgeau, the botanist, also separated himself from the party this Spring and has arrived here [Norway House, Rupert's Land] with his collections, intending to proceed without delay to Europe.—Dr. Hector, the second in command, quitted Edmonton for England, via the plains, last month, leaving Captain Palliser alone with his Secretary Mr. Sullivan . . ." C.O.6/30 "Hudson's Bay Company." The information about Blakiston was correct; that about Hector unfounded. The implication as to Bourgeau's departure was misleading. Despite an urgent invitation to remain with the Expedition "a previous engagement for the Caucasus compelled him to depart" (*Reports*, 1863, p. 15).

[118] Blakiston from Fort Carlton, 31 October 1858, in a private letter to Sabine: "Having split with Palliser (only officially as we are as good friends as ever) . . ." C.O.6/31 "S."

[119] C.O.6/23 "P." The completed instructions are printed in *Reports*, 1859, and *Reports*, 1863.

[120] Hooker to Higgins (a clerk at the Colonial Office), 31 March 1857; Murchison to Ball, 1 April 1857; Sabine to Ball, 3 April 1857, and Ball to Higgins, 3 April 1857, with a minute about an interview with Dr. Bird. (All in C.O.6/22 "Treasury");

Hooker to Ball, 6 May 1857 (C.O.6/22 "Miscellaneous Offices"); and Rae to Norton Shaw, 30 March 1857 (Rae, Dr. John, Block, R.G.S. Archives).

[121] Palliser to Colonial Office on 4 May 1857, asking for passages to be booked for May 16, and on May 14: "Having engaged accommodation on board of Royal Mail Steamer Arabia I beg to report that in company with Doctor Hector, Mr. Sullivan and Mons[r] Bourgeau I leave London tomorrow for Liverpool on my way to North America." C.O.6/23 "P."

[122] *Reports*, 1859, p. 6 and *Reports*, 1863, p. 25. See also Palliser's letter to his father, 17 July 1857, from Fort Garry, published in *The Beaver*, December 1938, p. 39.

[123] Letter from Palliser to his father, 17 July 1857, *op. cit.* 'Solitary rambles' describes Boucharville, and Palliser's adventures in his company in the winter of 1847–8, chs. VIII–XI. Coues in notes in 'Forty years a fur trader on the Upper Missouri' confirms Boucharville's fame: "Audubon went to Fort Mortimer to ask Mr. Collins . . . to let him have a hunter called Boucharville to go after mountain sheep. This man was a famous hunter and trapper," p. 18.

[124] Simpson, Sir George, 'Narrative of a journey round the world during the years 1841 and 1842,' London, Henry Colburn, 1847, p. 80.

[125] Simpson to Burbank, St. Paul, 23 November 1858, H.B.Co. Archives, D4/78, folio 576. MacTavish wrote of Lord Richard Grosvenor (Fort Garry, 8 December 1858, H.B.Co. Archives, D5/47, folio 695), Simpson, of Lord Robert Grosvenor, though he wrote later (26 June 1859) of Lord Richard Grosvenor (H.B.Co. Archives, D4/79, folio 876–5).

[126] Simpson to Alex. H. Murray, 21 June 1858, H.B.Co. Archives, D4/78, folio 882.

[127] Palliser to Christie, 4 September 1857, copy in H.B.Co. Archives, D5/44, 1857 (2), folio 273 reverse.

[128] Hector wrote from Fort Carlton, 1 May 1858 ". . . we are next thing to starving here, and so they have been all the winter." Microfilm of Hector Papers, Hocken Library, *op. cit.* Correspondence in the Hudson's Bay Company Archives confirms the unusual scarcity of buffalo and shortage of food supplies. See also: *Reports*, 1863, for example p. 138, as to the "want of food" at Edmonton.

[129] Their routes are shown on the accompanying map.

[130] I have not been able to identify precisely the point above the Elbow of the South Saskatchewan at which Palliser reluctantly turned north towards Carlton on 26 September 1857 (*Reports*, 1863, p. 55). His estimate of the length of the unexplored stretch of river remaining between this point and the junction of the South Saskatchewan (Bow) and Red Deer as only 30 (*Reports*, 1860, p. 8) and, later, 60 miles (*Reports*, 1863, p. 11) seems certainly to be too short. Hind's estimate of "300 miles in a straight line" seems too long (Hind to Secretary of State for Colonies asking for grant of £2000 to complete this exploration, 18 October 1859, C.O.6/21 "H"). The actual distance was probably somewhere between these two estimates, taking into account the "sinuosities" of the river. Blakiston had wanted to have a canoe made ". . . to descend Bow River and the south branch to the Forks of the Saskatchewan . . ." (*Reports*, 1860, pp. 32–3), but Palliser "after due deliberation" "dismissed the idea as too dangerous and probably altogether impracticable." Palliser to Newcastle, 20 November 1860 (C.O.6/32 "P") with reference to Blakiston's statement in his report which ended ". . . I was informed that it was an unknown river; I need only further say that it is still equally unknown."

[131] The report also describes transverse passes between the headwaters of the Saskatchewan and of the Kootenay and Columbia. See also Blakiston's report, *Reports*, 1860, pp. 22 and 60. Palliser's first letter (received 25 January 1859, with Hector's report enclosed) announcing that the existence of at least four practicable passes had been established, dated 7 October 1858, was published in *Reports*, 1859, pp. 29–40.

[132] Tyrrell, *op. cit.*, p. xlix and li.

[133] There had been a considerable correspondence about Palliser making contact

with Major Hawkins (C.O.6 series). Hawkins had left for a visit to England when Palliser arrived.

[134] The river steamer they had hoped to take down the Columbia had blown up. They proceeded by canoe but their baggage entrusted to a schooner was set fast in the ice for several weeks. *Reports*, 1860, p. 19–20.

[135] H.B.Co. Archives, D4/84a, folio 578.

[136] Ellice to Bulwer Lytton, St. Anthony, 16 September 1858, *ibid.*, folio 563.

[137] To Dallas, H.B.Co. Archives, D4/84a, folio 157.

[138] C.O.6/30, "Hudson's Bay Company." Simpson's letter is dated 25 April 1859. (H.B.Co. Archives, D4/78, folio 77.)

[139] H.B.Co. Archives, D4/77, folio 353.

[140] H.B.Co. Archives, D4/84a, folio 484.

[141] 12 January 1858 to Norton Shaw, R.G.S. Archives, Rae Block. Hector later named a mountain after John Rae. There is a note by Norton Shaw on this letter: "Pallisers Observ^{ns} received seem to be *good* [*sic*]."

[142] Memorandum of January 14, on a letter dated 12 January 1859, from the Hudson's Bay Company. C.O.6/30 "Hudson's Bay Company."

[143] Other than a Mr. Gairdner to whom, as the only person at the Colonial Office who was interested, Hooker wrote about Bourgeau on his return, 24 August 1859, C.O.6/30 "Miscellaneous Offices."

[144] In a memorandum dated 4 January 1858 about Palliser's report from Montreal of 8 December 1857, describing the trip from Pembina along the boundary to Turtle Mountain, which reached the C.O. on 29 December 1857. C.O.6/23 "P."

[145] 29 June 1858, C.O.6/29 "P."

[146] C.O.6/29 "P."

[147] C.O.6/29 "W."

[148] C.O.6/29 "W," 14 September 1858.

[149] Minute dated January 15, re Hudson's Bay letter of 12 January 1859, about accounts, C.O.6/30 "Hudson's Bay Company."

[150] C.O.6/29 "P."

[151] 8 February 1859, C.O.6/30 "Treasury." The earlier contrary decision is minuted (n.d. but in the latter part of January 1859) on the letter re accounts from the H.B.Co. dated 12 January 1859. A.B[lackwood]'s minute, January 24, on this paper reads: "Properly speaking, after the emphatic warning Cap^{t} P. has had he sh^{d} be left to get on as best he can without a vote. But I fear that that stern proceeding cannot really be adopted." C.O.6/30 "Hudson's Bay Company."

[152] H.B.Co. Archives, D4/79, folio 340.

[153] C.O.6/31 "B."

[154] C.O.6/32 "P." The original estimate and vote for two seasons (1857 and 1858) was £5000. Two additional appropriations of £1500 each were sanctioned and the total ultimate cost was something under £13,000 covering both the interpolated canoe trip from Lake Superior to Red River; Blakiston's salary and expenses, which the Colonial Office had assumed the War Office would pay; and two extensions of the time spent by the Expedition on its work.

[155] Notation dated 31/3 1877, signed "W.D." (perhaps Mr Dealty?) among the memoranda concerning Edward Palliser's application for a C.M.G. for John Palliser. C.O.447/27. Compare, however, the derogatory comments on some of Palliser's conclusions in 'Ocean to ocean' (Sampson Low, London, 1873) by George M. Grant, who accompanied Fleming in 1872. They seem to misinterpret Palliser's report.

[156] Geological Survey of Canada, 'Report of Progress for 1873–4,' Montreal, Dawson Brothers, 1874, p. 68.

[157] See Geographic Board of Canada, 'Place Names of Alberta,' Ottawa, 1928.

[158] MPG 395 and MR 109.

[159] Bell, R., Geological Survey of Canada, *op. cit.*, pp. 67 and 74. Palliser's original sketch-map clearly states that such a connection was "*said to*" exist (my italic). Last

Mountain Lake and Buffalo Pound Lake seem to have been mixed up. Palliser's first report dated 8 December 1857, as to the possibility of navigation from the South Saskatchewan at the Elbow through to the Qu'Appelle and Assiniboine (*Reports*, 1859, p. 14), was certainly over optimistic. Simpson wrote to him ironically suggesting that he should arrange to try this alleged through navigation by sending "a small canoe from the Assiniboine to the South Branch at highwater the ensuing spring." (17 March 1858, H.B.Co. Archives, D4/77 1857–8, folio 204–3.)

[160] C.O.6/38 "A," 19 November 1863. The Colonial Office felt it could not delay any longer and sent the maps to Stanford, who, it was expected, would finish the work quickly. There is a minute by Elliot on the letter to this effect, also indicating that thereafter the material could be sent back to Arrowsmith. The map by Stanford was not, in the end, published until 1865 (*Reports*, 1865).

[161] For example by Patterson, *op. cit.*

[162] Tyrrell, J. B. 'Journals of Hearne and Turnor,' p. 88.

[163] Coues, Elliott, 'New light on the early history of the greater Northwest, the manuscript journals of Alexander Henry, fur trader of the Northwest Company, and of David Thompson, official geographer and explorer of the same company, 1799–1814,' New York, 1897, Francis P. Harper, p. xi.

[164] Coues, *op. cit.*, especially pp. 534–8 and Tyrell, 'David Thompson's Narratives,' *op. cit.*, Part I, chs. VI, VII, XIV, XXII, XXIII, and XXIV.

[165] Thompson's map and journals were in the Crown Lands Office, Toronto, Canada, Hind, *Reports of Progress*, 1859, *op. cit.*, p. vi, and Coues, Elliott, *op. cit.*, p. xx. Hind had access to Thompson's material and used his map.

[166] 'Report on the Geology and Resources of the Region in the vicinity of the Forty-Ninth Parallel from the Lake of the Woods to the Rocky Mountains,' Montreal, Dawson Brothers, 1875, p. 20–1. See also Kupsch, W. O., 'Pioneer geologists in Saskatchewan,' Saskatchewan Department of Mineral Resources, Regina, 1955.

[167] 26 January 1859, C.O.6/31 "S." Also that he had "acquitted himself with exemplary zeal and assiduity . . ." and had fully accomplished the objects of the Expedition in the field of terrestrial magnetism. After he had left the Expedition there was a long discussion as to what should be done about Blakiston's reports which he had refused to hand over to Palliser and which, therefore, could not be considered as officially authenticated. A report of his Kootenay Pass explorations had already been published through Sabine in the *Occasional Papers* of the Royal Artillery Institution. This was afterwards incorporated (with some amendments) in *Reports*, 1860. His magnetic observations were apparently reported direct to Sabine and do not seem to appear in the Colonial Office papers. They formed the basis of three papers for the Royal Society.

[168] Hooker, acknowledging a "highly interesting report," 31 July 1859; Hooker to Gairdner, 24 August 1859; and to Merivale, 27 September 1857. He wrote of Bourgeau that a "better botanical collector . . . never accompanied any British Scientific Mission" and "warmly commended" his work. (All in C.O.6/30 "Miscellaneous Offices.")

[169] Geological Survey of Canada, *op. cit.*, p. 20.

[170] *Reports*, 1863, p. 7. Elsewhere (p. 13) Palliser writes of "the limit of the fertile belt, in longitude 105°" while proceeding westward along the boundary line. This would make the base of the "Triangle" 105° to 114° (or 113° according to *Reports*, 1860, p. 9, and *Reports*, 1863, p. 12). Clearly the boundary of such an area could not be precise: it was necessarily a penumbra rather than a line.

[171] Apart from missionaries who had themselves a special point of view.

[172] *Cf.* above (p. 156) as to the attitude of the then Under-Secretary of State, John Ball, in originally urging that the Expedition should be financed. *Cf.* also Lytton's statement of 15 January 1859, quoted above p. 163.

[173] Colonial Office to Treasury, proposing the appropriation for the Expedition, 22 January 1857, C.O.6/22 "Miscellaneous Offices."

[174] Palliser in a private letter to the Secretary of State, from Montreal, 13 March 1858 (C.O.6/29 "P"). This was not published.

[175] Carnarvon to Palliser (C.O.6/31 "P"). Palliser's reply was published in *Reports*, 1860.

[175a] Hansard, Vol. 151, Col. 1819. There are other meagre references to Palliser's *Reports* in debates, especially 29 July 1859, Vol. 155, Cols. 671–4.

[176] *Cf.* above, p. 163 *et seq.*

[177] C.O.6/30 "Hudson's Bay Company," note dated 16 March 1859 on Berens's letter to Lytton dated 15 March 1859. Of course similar advice came from other sources, which adds to the difficulty of disentangling Palliser's influence.

[178] C.O.6/31 "S" on a letter from a Mr. Scoble.

[179] 5 February 1859, C.O.6/31 "D."

[180] Hind to Secretary of State for the Colonies, 18 October 1859, enclosing a letter dated 17 March 1859, from the Secretary's Office, Toronto, C.O.6/31 "H."

[181] Minute by A. Blackwood, 7 February 1859, re Dawson's letter, *op. cit.* John Ball wrote that "scientific friends" "residing on the continent" were interested in Palliser's Expedition. 19 February 1859, R.G.S. Archives, Ball, J., Block.

[182] But *cf.* Macoun, John, 'Manitoba and the Great North-West,' Guelph, World Publishing Company, 1882, p. 142: "As far as public opinion was concerned the only immediate result of the exploration was that a certain district in the north became known as the "Fertile Belt," and that the southern part, about which so little was said, was set down, or assumed to be, arid and of slight value; an opinions till [*sic*] generally prevalent and mainly fostered by writers whose views have been based on a misinterpretation of Capt. Palliser's remarks." I know of one family which later took up land in the north instead of the south on account of Palliser's report, probably not an isolated case.

[183] Later the term "Fertile Belt" took on a different meaning from the one Palliser gave it. To Canadians it meant the whole strip of prairie country along the 49th parallel. This was the meaning the phrase assumed in relation to compensation to the Hudson's Bay Company for giving up its proprietary rights under its Charter. A reference in a "Report of a Committee of the Honourable the Executive Council [of Canada] approved by His Excellency the Governor-General in Council, on the 22nd day of June 1866," makes the difference clear: "This fertile tract is a belt of land stretching along the northern frontier of the United States to the base of the Rocky Mountains. . . ." Reproduced in 'Correspondence between Her Majesty's Government and the Hudson's Bay Company,' London, 1869. Henry Kent Causton & Son, p. 75.

[184] See W. A. Mackintosh, 'Prairie settlement: the geographical setting,' Toronto, Macmillan, 1934, chs. II and VI. It is noticeable that in periods of drought, like the thirties, Palliser's stock as a shrewd observer goes up, while in periods of plentiful moisture there is a tendency to feel he was short-sighted in not appreciating the agricultural potential of his Triangle.

[185] 13 March 1858, C.O.6/29 "P." As Palliser's scheme involved purchase by the Imperial Government of the stock of the Hudson's Bay Company it was, of course, not acceptable to a government which felt that ". . . any appropriation of Imperial funds by vote of Parliament to the compensation of the Company must be considered as out of the question." Rogers to Hudson's Bay Company, re proposals of 11 November 1863, C.O.6/38 "Miscellaneous Offices."

[186] The Rev. Mr. Nicolay, who had already had an interview with Labouchere and written to Gladstone, wrote again about the condition of the Indians, using Palliser's despatch of 16 July 1857 in support of his views. 19 November 1859, C.O.6/23 "N." The despatch had been "lent to Mr. Lowe," presumably Robert Lowe, who, as Liberal Vice-President of the Board of Trade, made a tour of Canada in 1856. See Galbraith, *op. cit.*, p. 339.

[187] Hind's proposal of a trip "from the Red River by the South Branch of the Saskatchewan, and across the Rocky Mountains to Thompson's and Frazer's [*sic*]

river in British Columbia" with "an escort of 50 young men from Canada" (18 October 1859, C.O.6/31 "H") might have had decidedly different results! *Cf.* Merk, *op. cit.*, p. xxxii *et seq.*, for an illuminating comment on Indian relations in British North America.

[188] He was preoccupied with the importance of steam-boat navigation of which he had seen a good deal on the Mississippi and Missouri. He suggested the use at the Grand Rapids of the Saskatchewan of the American technique of "warping" steam-boats which was later used in Canada.

[189] 25 August 1859, H.B.Co. Archives, D4/79, folio 787.

[190] An excellent account of this shift is given by Gluek, Alvin C., "The Fading Glory," *The Beaver*, Winter 1957, pp. 50–5.

[191] See Creighton, Donald: 'The commercial empire of the St. Lawrence, 1760–1850,' Ryerson, Toronto, 1937.

[192] See especially the episode near Pembina (*Reports*, 1859, enclosure No. 4 and *Reports*, 1863, pp. 39–40) and at Fort Shepherd, near the mouth of the Pendoreille River, B.C., 4 September 1859 (*Reports*, 1863, p. 160).

[193] Hammond from the Foreign Office to Hawes at the War Office, 18 January 1858. Copy in C.O.6/25 "Foreign Office" and Merivale to Palliser, 19 February 1858, C.O.6/25 "Foreign Office." It was not until 1872–4 that the boundary from the Rockies to Lake of the Woods was finally laid down.

[194] See Galbraith, *op. cit.*

[195] Dufferin to Carnarvon, Ottawa, 16 March 1876. The original documents are in the Carnarvon Papers in the Public Record Office with a copy in C.O.447/26. Among other memoranda concerning a possible C.M.G. for Palliser, is one initialled by Carnarvon which seems to have been decisive in transmuting the original flat refusal (1876) to favourable consideration, and, finally, award of the C.M.G. to Palliser in 1877.

IBN BAṬṬŪṬAH'S ANDALUSIAN JOURNEY

H. T. NORRIS

IT IS STRANGE that Shaykh Abū 'Abdallah Muḥammad Ibn Baṭṭūṭah, one of the greatest of Muslim travellers, should have delayed his major visit to Spain until the latter part of his career. He was born in Tangier, within sight of the Spanish coast, on 24 February 1304 and he died in 1368/69, in Morocco, "the best of countries, for in it fruits are plentiful and running water and nourishing food are never exhausted."

He was a Berber, combining literary pursuits with an insatiable thirst for travel. It is on his personal record of the political and social conditions of Islām in the fourteenth century rather than on his geographical observations that posterity has assessed his achievement. The religious devotion of the Moor and the enthusiasm of the scholar impelled him to enter new regions of Asia and Africa, within and without the Muslim world; to Egypt, Asia Minor, Arabia, Persia, India, China and the Indies and eventually to West Africa.

Twenty-four years of his life were spent in Eastern travel by land and sea and sometimes he was exposed to great physical danger. It was not until 1349 that he returned westward to enjoy the remainder of his days in peace and tranquillity in his homeland. On his return he was received in great honour by the Amīr of Fez, Abū 'Inān. Esteemed and contented, he might well have decided that there was no need for him to proceed on further travels, either in Africa or in other lands as yet unvisited. But retirement from a life of journeying soon became intolerable. After visiting the tomb of his mother in Tangier, he proceeded to the port of Ceuta (Sabtah), where he stayed for some months. The reason for this sojourn is unknown. It is more than probable, however, that the journey there was made by land. Since the capture of Algeciras by Alfonso XI in March 1344, and the earlier capture of Tarifa in 1299, the sea routes were precarious. The Christian capture of these two Muslim cities had totally upset the traditional sea links in the Straits between Spain and Africa. These had been either from Ceuta to Algeciras or from Qaṣr Maṣmūdah, a strategic port lying between Tangier and Ceuta, and Tarifa. The capture of both these Spanish cities, Algeciras in particular, was of tremendous value, and Christendom was now almost in command of the Straits. It is not surprising, therefore, that when news of the fall of Algeciras reached Ibn Baṭṭūṭah in Baghdad in 1348, he should have exclaimed "may God repair the breach that Islām has suffered thereby." The loss of both, besides revealing the inability of the Kingdoms of Fez and Granada to unite permanently, had weakened the value of the Muslim seaports on the southern shore of the Straits, and paved the way for their subsequent capture by the Portuguese. It is quite likely that Ibn Baṭṭūṭah visited Qaṣr Maṣmūdah,[1] en route to Ceuta, as it was a convenient "half-way" point between Tangier and Ceuta; a day's march from both, and twelve miles from the latter. It possessed a strong castle on Cape Rās al-Majāz, the nearest point to the Spanish coast, and ships and wherries were constructed in its harbour. It was surrounded by trees, and was inhabited by the Banū Ṭarīf, a branch of the Maṣmūdah who gave the port their name.

Ceuta, however, was the vital link between Muslim Africa and Spain. Two miles

[1] Also referred to in Arabic accounts as Qaṣr al-Majāz (the Castle of the Crossing) and al-Qaṣr al-Awwal (the First Castle).

Miles
20 0 20 40 60 80
Granada
Alhama (al-Hammah)
S P A I N
Almeria
Malaga
Vélez (Ballash)
Ronda
Guadiaro
R. Guadalquivir
Jerez
Cadiz
Medina Sidonia
Gaucin
SUHAYL
Dhakwan
Fuengirola
Marbella
Jimena
Castellar
Estepona
L. de Janda
Carteya
Algeciras
Gibraltar (Jabal Tariq)
Tarifa
MEDITERRANEAN SEA
Straits of Gibraltar
Ceuta (Sabtah)
Jabal Mūsā (Mt. Abyla)
Qaṣr Maṣmūdah
Tangier (Tanjah)
Taṭwān
Asilā
Larache
GHUMĀRAH
Bādīs
MOROCCO
Rabat (Ribāṭ)
Salé
Fez (Fās)
6°
36°
2°
North Bastion
One furlong
Land Gate
Sea Gate
La Barcina
La Calahorra
Villa Vieja
Qaṣabah
Gate of the Qaṣabah
La Turba
N
CITY OF GIBRALTAR
in later Middle Ages

to the west of it rises the rounded peak of Jabal Mūsā (Mount Abyla), named after Mūsā bin Nuṣayr, Ṭāriq's superior, below which lay a fertile district called Balyūnish, containing abundant streams and productive orchards. In medieval times the whole city of Ceuta was surrounded by gardens, orchards and trees producing fruit in abundance. Sugar-cane and citron trees flourished and the fruits were transported from the distict of Balyūnish into the interior. The city of Ceuta was built on seven small hills connected one with another. It was a walled city, possessing nine towers and a gate on its western side facing the hinterland. This side was additionally protected by a curtain wall and a fosse. The city was well populated and was almost a mile from west to east, occupying a peninsula shut in by the sea on every side except the west. Many of the finest buildings, including the "Cathedral Mosque" and the centre of government, were in the south of the city. The east of the peninsula was commanded by a mountain known as Jabal Manīyah or Jabal Mīnah, covered with defence walls and other fortifications, built by al-Manṣūr, minister of the Umayyad ruler Hishām II, it having at that time been chosen as an alternative site for the city. Ceuta boasted an excellent harbour and was an important trading centre for the African interior. There was a market for sorting, polishing, piercing and fashioning coral, which was transported abroad, the greater part to the kingdom of Ghānah in the Sudan. Many steam baths were to be found in the city, sea water being used, as fresh water was precious; and there were many traces of the earlier Byzantine city which had flourished before the Arab conquest.

While Ibn Baṭṭūṭah was in Ceuta he suffered from an illness for three months, "but afterwards God restored me to health." Many times during his stay and convalescence he must have gazed at the massive shape of the opposite coast named Jabal al-Fatḥ (the Mountain of the Conquest), which from boyhood he knew to be Ṭāriq's mountain. Its associations with the conqueror of Spain and the days of bygone splendour were well known to him. The news he had heard from men who had crossed from Andalusia filled him with anxiety for the future and impressed upon him the necessity for holy war in defence of the Muslim possessions.

When his health was restored he wished to avail himself of the opportunity to take part in the Jihād and the defence of the frontiers of Islām in Spain. "So I crossed the sea from Ceuta in a coastal craft belonging to the people of Asīlā[1] and reached the land of al-Andalus where the reward of the dweller is abundant, and a recompense is laid up for the settler and the visitor."

Ibn Baṭṭūṭah landed at Gibraltar, which had become the funnel through which close communication was maintained between Ceuta, Tangier and Muslim Spain. "I walked round the mountain and saw the marvellous works executed on it by our master (the late Sultan of Morocco) Abu'l-Ḥasan, and the armament with which he equipped it, together with the additions made thereto by our master (Abū 'Inān), may God strengthen him, and I should have liked to remain as one of its defenders to the end of my days." While in Gibraltar, Ibn Baṭṭūṭah met a number of its leading officials, including the orator Abū Zakarīyā Yaḥyā, and the judge (qāḍī) 'Isā'l-Barbarī with whom he stayed and with whom he visited the sights of the peninsula. This brief comment is considerably expanded by Ibn Baṭṭūṭah's scribe, Ibn Juzayy, who was far better acquainted with Gibraltar and had resided there during the siege of Algeciras by the Christians between 1342–4. He refers to the Mountain of the Conquest as "the citadel of Islām, an obstruction stuck in the throats of the idolaters." This description is hardly poetic, and reflects the spirit of the age, when

[1] A port lying on the Atlantic coast of Morocco between Tangier and Larache. According to al-Bakrī, the Berbers of Ceuta were from the provinces of Asīlā and al-Baṣrah. It is possible, therefore, that the craft was a local one manned by Berbers from Asīlā.

Gibraltar was a place where Muslims stood guard in constant readiness for bitter war. The phrase is akin to that given to the Rock after the foundation of the first city of Gibraltar, by 'Abd al-Mu'min, the Almohad in A.D. 1160. It was from there, "like a blow of a club, he struck at his Christian foes." It would, however, give a false impression if the Rock is portrayed simply as a fortress. Since A.D. 1160 it had possessed rich lands in the hinterland and the peninsula contained gardens, irrigation systems, windmills, water-cisterns and palaces. Ibn Juzayy is at pains to point out the close historical link between the later Gibraltar and the original conqueror Ṭāriq bin Ziyād, whose name it bore, and that the remains of the wall built by the latter and his army were still in existence in his day.[1]

Gibraltar had been captured from the Christians in 1333, by the Marīnid ruler Abu'l-Ḥasan. He had sent his son Abū Mālik, the so-called King of Algeciras and Ronda, to invest it, and the city fell after six months' siege. As a trophy of the conquest Abū Mālik had removed a great bell weighing ten hundredweight to Fez, and this, reshaped as a lamp, was hung in front of the gate called Bāb al-Kutubīyīn in the mosque of al-Qarawiyīn. At the time of the Muslim recapture the city had been heavily bombarded by siege-engines and a tremendous programme of rebuilding was therefore imperative. Like their Almohad predecessors, the aim of the Marīnids was to use Gibraltar as a springboard for counter-attack. A system of *rubuṭ* was established. These institutions were primarily fortresses where troops were concentrated at exposed points on the borders between Islām and Christendom. They also served as places of refuge and watch-towers to give warning of enemy attack. According to the historian al-Maqqarī, large quantities of men and munitions of war were sent to both Gibraltar and Algeciras, then still in Muslim hands, and tremendous sums were spent on constructing new walls and towers. Preachers were sent to rally support for the holy war and great gifts and rewards were presented to those who would come over to Gibraltar and Algeciras to fight in the cause of Islām. In the highest point of the Qaṣabah in Gibraltar, in the place occupied by a smaller Almohad or Spanish tower, which had been ruined by siege-engines, a great keep was built, and around the "Red Mound" (at-Turbah al-Ḥamrā), a region of Red Sands located to the south of the city, an extensive wall was constructed extending from the arsenal to the tile yard.[2] Apart from reconstructing the arsenal, he also erected buildings of a non-military nature, including a "Cathedral Mosque." Abu'l Ḥasan's successor, Abū 'Inān, continued the great enterprise of rebuilding the city of Gibraltar, paying particular attention to the extremity of the peninsula. A wall—"the most formidable and useful of its walls"—had been built there by his predecessor, surrounding the mountain on all sides "as the halo surrounds the crescent moon, so that the enemy could discover no prospect of success in attacking it, nor did there appear any way through which he could force an entrance." Abū 'Inān strengthened this and large quantities of munitions, foodstuffs and provisions of all kinds were sent to Gibraltar.

Abū 'Inān, however, was not interested in Gibraltar solely as a place of defence. Perhaps more than any other Moroccan ruler, 'Abd al-Mu'min the city's original founder excepted, he combined shrewd military insight with a fascination for the place itself, its unique character and position. According to Ibn Juzayy, "his concern for the affairs of the Jabal reached such lengths that he gave orders for the construction of a model of it, on which he had represented models of its walls,

[1] This seems highly improbable. The most likely explanation is that the wall (which was on the summit) was a relic of the Almohad city of 1160.

[2] A place of doubtful locality, perhaps in the vicinity of the present-day Scud Hill in central-south Gibraltar.

towers, citadel, gates, arsenal, mosques, munition-stores and corn granaries, together with the shape of the Jabal itself and the adjacent Red Mound. The model was executed in the palace precincts; it was a marvellous likeness and a piece of fine craftsmanship. Anyone who has seen the Jabal and then this copy will recognize its merit."

It is possible to obtain an extremely comprehensive picture of Gibraltar at the time of Ibn Baṭṭūṭah's visit, because its existing Moorish monuments date almost entirely from that period. Medieval Gibraltar occupied the most northerly part of the modern city on a site adjoining the steep cliff which limits the peninsula to the north and faces the narrow tongue of isthmus dividing Gibraltar from Spain. On the most elevated and steepest part of this district, overlooking the sea, was the Qaṣabah, divided into three sections, the most easterly dominated by a keep called La Calahorra[1] by the Spaniards and known today as the "Tower of Homage." This is the tower built by Abu'l Ḥasan, and it was the pivot of Gibraltar's defences. The lower sections of the Qaṣabah contained extensive living quarters, cisterns and gardens. Below the lowest section lay a district called Villa Vieja by the Spaniards. This was probably the original nucleus of the city and was enclosed within its own walls which had several gateways, probably the most important being the Granada Gate. The whole ward contained habitations and mosques in the fourteenth century. To the west of the Villa Vieja lay a ward called by the Spaniards La Barcina, wedged between the narrow stretch of land at the base of the Rock and the Bay. It also had its own walls and independent gateways. Perhaps the two most important were the Land Gate which faced towards the Isthmus and which was the only exit from the pensinsula, and the Sea Gate which faced the shore. This gate had an arched entrance between two strong towers, entrance being granted through a right-angled passage, a common Moorish design.

Upon the shore and near to the Sea Gate was the arsenal or naval shipyard (Dār aṣ-Ṣinā'ah). According to Ibn Juzayy, Abu'l-Ḥasan constructed it in 1333, "for there was no arsenal in the place before." This assertion is doubtful, however, as it appears that the Christians constructed one some time after their occupation in 1309. As early as 1279 Arab accounts refer to fleets of vessels putting into Gibraltar and remaining at anchor overnight. It seems likely therefore that the arsenal of fourteenth century Gibraltar was a reconstruction of an earlier Spanish one built by Ferdinand IV, which may have had an even earlier predecessor. In the later Middle Ages a water conduit terminated at the arsenal. This water channel furnished water for the ships anchored within the arsenal and also supplied the castle and much of the city. This no doubt replaced the earlier system built in 1160, when engineers had excavated in the rock face at places where there were natural streams of fresh water. These streams were subsequently linked together by means of small channels and thence conveyed into an aqueduct which descended into the city and terminated in a huge cistern. The water so stored was used as drinking water both by humans and by animals, as well as for irrigating the luxurious gardens in the suburbs. There was also the natural water supply from caves at the base of the Rock (noted by al-Idrīsī) and from St. Michael's cave on the Upper Rock which once had an ancient wall at its mouth, possibly erected for water storage. According to Lt. Col. Thomas James, writing in the eighteenth century, "when the Moors first raised this sea-line wall, they placed earthen pipes in the same, to conduct the

[1] This tower is referred to in the Arabic text as al-Qāhirah al-Uẓmā, or al-Ma'tharah al-Uẓmā. It is possible that the name Calahorra is derived from al-Qal'ah al-ḥurrah (the Independent Citadel) as it appears that this name was bestowed upon towers of exceptional importance and size, which dominated their immediate surroundings.

water from the Grand Parade to Waterport, where was formerly a large basin to receive it." The source of this water supply lay in the area of the Red Sands to the south of the southernmost city wall.

The ward to the south of La Barcina was occupied by gardens and orchards, palaces, mosques and perhaps more humble residences. In the sixteenth century it was given the name La Turba[1] (crowd), supposedly on account of the type of population who dwelt there, but it is clear from the remains that exist that, in the Moorish period, it contained some of the city's finest buildings. Within the western sea wall there were at least two gates, a "gate of the baths," probably in the vicinity of the still existing multi-chambered fourteenth century Moorish steam-bath beneath the Gibraltar Museum. Further to the south was another gate known as the "Algeciras Gate." It is uncertain whether another wall sealed La Turba from the adjacent area of the Red Sands and the southern part of the peninsula. Within this ward was located the "Cathedral Mosque" (al-Jāmiʿ al-Aʿẓam) built by Abu'l Ḥasan. It was of considerable size and marble was used in its construction. It included an arched courtyard (Ṣaḥn) of orange trees, and this existed comparatively intact up to as late as the eighteenth century.

The southern tip of Gibraltar, Europa Point (Ṭaraf al-Fatḥ), was of considerable importance in the fourteenth century. Throughout Gibraltar's history the danger always existed of an enemy attempting to attack the city from the south and after establishing himself in a commanding position on the summit of the Rock, descending into the residential districts or outflanking the Castle's defences. Apart from watch-towers, defence points with fire towers (*rubuṭ* and *maḥāris*) and walls, the base of the peninsula appears to have possessed secular and religious buildings (*e.g.* Nuestra Señora de Europa, perhaps originally a mosque), and at least one giant cistern (*i.e.* that known today as the Nun's Well). Other Moorish structures existed on "Windmill Hill" (the eighteenth century "Yard of Fez"), immediately overlooking the southernmost point, and also on the upper slopes of the Rock were sited look-out points, rain-storage systems and Ṭāriq's Wall (Sūr al-ʿArab).[2]

Ibn Baṭṭūṭah was clearly impressed by the tremendous spectacle and feverish vitality of Marīnid Gibraltar and wished to remain as one of its defenders to the end of his days. He was a *Murābiṭ*, a volunteer, who had taken a vow to devote himself to the defence of Islām and to serve a period in a *ribāṭ* as a member of the garrison. But in spite of his vow, after a stay of unknown duration, Ibn Baṭṭūṭah set out for Ronda, a three day journey. It seems there were family reasons for his visit, as he tells us that the qāḍī was his cousin, the doctor Abu'l-Qāsim Muḥammad Ibn Yaḥyā Ibn Baṭṭūṭah.

We do not know his route but most likely it was more or less identical with the present one through Jimena de la Frontera. He would have entered the sandy isthmus from the Land Gate, and travelled either by horse or mule along the coastal road towards Algeciras, then in Christian hands, and would have struck inland across fertile pasture land, and country heavily wooded with cork trees and forest under-

[1] One is tempted to see a connection between this name and at-Turbah al-Ḥamrā (the Red Sands) of Ibn Juzayy. The "Red Sands" proper lay further to the south, but there is no clear distinction.

[2] It is notable that neither Ibn Baṭṭūṭah nor Ibn Juzayy makes mention of the inhabitants of the Upper Rock—the apes. The Arab geographers and historians are silent as to their origin and even their very existence. This is not the case on the African side of the Straits. According to al-Bakrī, "There is no place in the world where so many apes can be found as at Marsā Mūsā (an ancient port lying beneath Mount Abyla and inhabited by the Banī Samgharah). These animals imitate the actions of men who pass near to them. If they see sailors rowing in their canoes they take sticks and try to imitate their actions."

growth. To the west he would have passed near the mountain stronghold of Castellar which was destined to remain in Moorish hands until the year 1434. He might have glimpsed from the distance its plain solid walls seemingly growing from the miniature mountain on which it is built, and seen the fires from the sentries on guard upon the stumpy towers built at intervals along its walls. Perhaps he passed it by, and never entered through its right-angled gate or rested or slept in white-washed houses crowded within the grey walls, shut away from the outside world of bandits, cattle thieves and shepherds.

The road would have taken him to Jimena. Its name in Moorish times was Kinānah and its inhabitants were of North Arabian origin. But clearly like so many of these towns it had an earlier origin dating back to Roman times. Apart from the picturesque position of its castle, Ibn Baṭṭūṭah must have been struck by the whiteness of its cottages erected along the sides of the slope facing the east. Its castle was extraordinarily strong. Built on a ridge and constructed from Roman materials, the narrow ridged ledge had been levelled to accommodate a citadel. In Moorish times the castle gate, which is still well preserved, was guarded by archers covering it from a wall built at right-angles to it and crowned with a row of pointed battlements. On the northern point of the ridge was a series of cisterns for storing rain water, partly cut into the rock and partly vaulted and cemented. To the south of the citadel was the castle keep protected by an exterior wall and a right-angled entrance. The keep itself contained a giant round tower, vaulted and constructed of Roman stones, completely dominating the neighbouring country and almost inaccessible from the foot of the precipice below.

After Jimena Ibn Baṭṭūṭah must have branched to the east and, crossing the Guadiaro river (Wādī Āruh), followed the gradually ascending road as far as Gaucín, which is a familiar halting place on the road from Gibraltar. There he no doubt rested and inhaled the dry, refreshing mountain air. Gaucín had its castle also, even more fantastic than that of Jimena, straddling a natural crag with a box-like keep built near its easternmost tip. Far below to the south, beneath steep ridges of rock and cultivated land, could be seen the sparkling river and the silhouette of Gibraltar partly hidden amidst low hills, haze and sea.

Leaving Gaucín, Ibn Baṭṭūṭah would have entered the Serrania of Ronda and Malaga which has been described as the "most picturesque part of Andalusia." According to a historian of the district, quoted by Dozy in 'Spanish Islam,' "here and there this mountain range attains true sublimity, with its majestic forests of oaks, cork trees and chestnuts, its deep and gloomy ravines, its torrents thundering over precipices, its ruined castles and villages clinging to the sides of mighty crags whose summits are bare of vegetation and whose flanks seem blackened and calcined by the lighting; elsewhere the landscape smiles with vineyards and meadows, with groves of almond, cherry, citron and pomegranate, or with thickets of oleanders yielding more flowers than leaves; here, shallow streams wind capriciously by orchards whose pears and apples supply all southern Spain; there, lie fields of flax, hemp, and above all, of corn, whence is made a bread which is held to be the whitest and most delicious in the world."

As Ibn Baṭṭūṭah approached this citadel in the mountain, the Ḥiṣn Rundah of the Arabs, he would have encountered a hardy, vigorous people, part Berber, part Arab, part neither, having inherited the traditions and traits of a mixture of people, who had lived in these mountains since Roman times. Along the road he must assuredly have encountered shepherds, for in Moorish times these mountains were famous for their flocks of ewes. A total of twenty thousand belonged to the city of Ronda alone. But, apart from its fertility and its mild climate, Ronda was also in

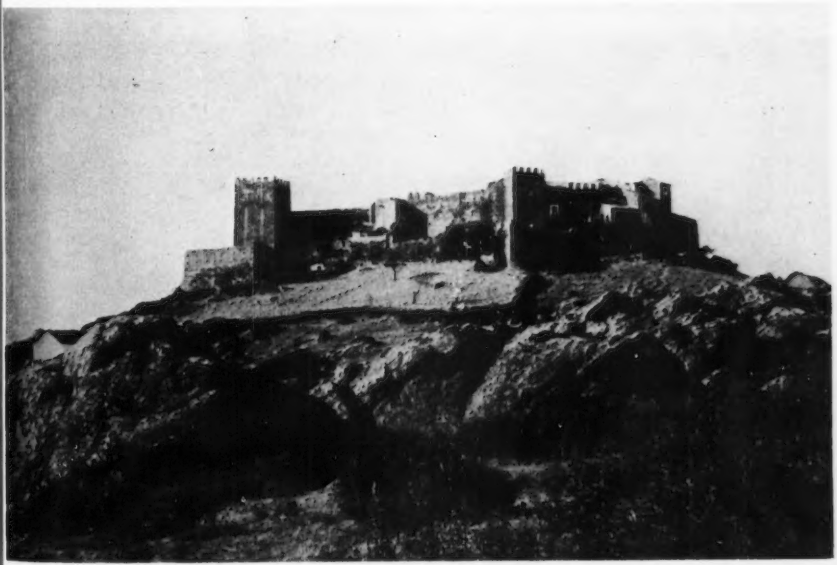
the centre of a rich region for quarrying multicoloured marble, black, white, red, grey and mottled, which was exported for building purposes to Malaga, Seville and elsewhere in Andalusia. There were also gold and silver mines in the district, lead on the road to Seville, and deposits of iron and tin near Gaucín.

From earliest times Ronda had been coveted and had witnessed many bitter struggles. Subject to the Berber rulers of Malaga, its Arab population rose in the middle of the eleventh century and under Mu'tamid of Seville the town was fortified and strengthened. During the prince of Seville's visit to inspect his works he was so enchanted that he exclaimed, "O Ronda! fairest jewel of my realm, never before didst thou boast such strength!" Later it had belonged to Granada but in the year 1319 it was ceded to the Marīnid King of Morocco, who gave it to Abū Mālik, his son, together with Algeciras, Jimena, Marbella and Gibraltar. This new grouping was to be of some historical significance, for it detached Ronda from its dependence on Malaga and linked it to Algeciras, and subsequently, after the fall of Algeciras, to Gibraltar. Three years before Abu'l Ḥasan strengthened Gibraltar's defences, Abū Mālik had established his court at Ronda, capital of the province of Tākarunnā. He had built a palace and a strong castle. He had also strengthened the natural defences by a triple circuit of walls and a network of gateways, some of which were used for entrance and others for exit. Water was brought into the town along two aqueducts, one from a village to the east, the other from Jabal Talūbarah to the west.

Ibn Baṭṭūṭah spent five days in Ronda, meeting several of the town's leading men of learning, and he stayed with one of them, Abu'l Ḥajjāj Yūsuf, an expert in literature, law and jurisprudence. His brief description of the town as "one of the strongest and most beautifully situated fortresses of the Muslims," gives no idea of the picturesque splendour and colour of Abū Mālik's capital. The natural position of Ronda with its amphitheatre of steel-grey mountain and the great gorge of the Tajo dividing the city was the ideal place for a Sultan's residence. Ibn Baṭṭūṭah would have entered it from the south, the Moorish city occupying the more southerly portion of the slopes overlooking the gorge. No doubt he visited the great mosque and may have seen, in passing, others with their short stunted red brick minarets faced with plaster and coloured tiles. He may have stood on the rubble ramparts overlooking the meadows and luxurious steam baths, sited in the valley beneath the Moorish and Roman bridges which spanned the entrance to the gorge. Perhaps he saw Abū Mālik's palace with its shaded courtyard, its stuccoed walls and the geometrically carved wooden roofs of the rooms facing its central pool. Other buildings attracting his attention were no doubt the whitewashed houses of the Moorish nobles constructed against the southern face of the gorge with their cool, vaulted chambers, their simple stucco decoration, their horse-shoe arched doors and windows and their luxurious gardens with fountains and trees of many varieties. At the foot of one of these palaces was a structure built by Abū Mālik which in ingenuity can be compared with the inventions of the Malaga engineer al-Ḥājj Ya'īsh for 'Abd al-Mu'min, the Almohad.[1] In order to ensure access to the river gushing below he had made a stairway of three hundred and sixty-five steps, more than two hundred and fifty feet deep, cut in the solid rock and descending the cliff in zig-zag fashion to a natural rent in the rock. The remaining portion had been built up from the bottom of the chasm with large blocks of stone, and the whole stairway terminated in a chamber and doorway like the entrance to some Egyptian tomb. At various levels in its descent, passages branched off from this staircase into spacious and curiously arched apartments to which light was admitted by narrow casements

[1] These included many machines, some of them in Gibraltar; a windmill on its summit and a transportable maqṣūrah in the great mosque at Marrākush.

A typical Moorish "fire-tower" near Tarifa; a chain of these once existed along the northern coast of the Straits of Gibraltar



Castellar, fortified mountain village between Ronda and Algeciras

A Moorish tower in Ronda, once part of a mosque or

The Gate of Justice of the Alhambra, the residence of the

opening into the sun-drenched gorge. Perhaps this structure served as a secret water supply, maybe it was some place of pleasure whose purpose remains a mystery. All we know is that Abū Mālik built it in the year 1339. It reveals that element of fantasy in the mental make-up of the Marīnids, that same element which induced Abū Mālik to remove the great Gibraltar bell to Fez and Abū 'Inān to model Gibraltar to satisfy his self-esteem.

But Ronda could not detain Ibn Baṭṭūṭah longer than five days. His eager desire to see and learn more led him on towards Malaga. On his way he passed the Marīnid port of Marbella (Marballah). The journey was difficult. The road wound tortuously and was "exceedingly rough." Even in our time the journey has an element of danger as here and there the road is hidden by precipitous corners and landslides. In the days when caravans brought supplies and luxuries it must have been the haunt of robbers.

Ibn Baṭṭūṭah reached the port of Marbella safely. He was greatly taken by it and describes it as "a pretty little town in a fertile district." It was located within rich, fig-growing country. His stay there was short, and his intention seems to have been to attach himself to a party in order to reach Malaga. He fell in with a company of horsemen and all had apparently been settled for the journey, when for some reason best known to the traveller he missed them: "Then God by his grace preserved me, for they went on ahead of me and were captured on the way." As the country was clearly unsafe for travellers to journey alone, Ibn Baṭṭūṭah made his own arrangements with another party. "I set out after them," he relates, "and when I had traversed the district (ḥawz) of Marbella, I entered the district of Suhayl." This district included many towns and villages and lay to the west of Malaga. It was given the name of Suhayl because of a certain mountain within its boundaries which was said to be the only spot in Andalusia from which the constellation of Suhayl or Canopus could be seen. In the course of his journey Ibn Baṭṭūṭah passed a dead horse lying in a ditch, and a little beyond it a basket of fish thrown on the ground. These objects aroused his suspicions. He noticed in front of him a watch-tower (burj an-nāẓūr) and said to himself, "If an enemy were to appear here, the man on the tower would give the alarm."

The watch-towers of this part of the coast are still landmarks today. Many must date back to Moorish times though all are not so old. Some are tall, circular structures; others square and high with projections for hoisting supplies into the upper stories where the sentries kept watch. At one time there were several in Gibraltar. One of the most spectacular can still be seen to the west of Tarifa on the summit of a giant rock with an elaborate series of steps as the only means of access. Facing the Straits, each tower within sight of its neighbour, this chain of towers was the first line of defence against enemy attacks. Ibn Baṭṭūṭah went to a house in the vicinity of the tower and found another slaughtered horse. While he was there he heard a shout behind him as he had gone on ahead of his party. On his return he found the commander (qā'id) of the fort of Suhayl with them. "He told me that four galleys (ajfān) belonging to the enemy had appeared there, and a number of men on board had landed when the watchman (an-nāẓūr) was not in the tower. The horsemen who had just left Marbella, twelve in number, had encountered this raiding force. The Christians had killed one of them, one had escaped, and ten were taken prisoner. A fisherman was killed along with them, and it was he whose basket he had found lying on the ground."

The commander of the fort of Suhayl (Ḥiṣn Suhayl), advised Ibn Baṭṭūṭah to spend the night with him in his quarters, so that he could escort him the remaining distance to Malaga. Ibn Baṭṭūṭah was only too glad to take advantage of the offer.

A Moorish tower in Ronda, once part of a mosque or The Gate of Justice of the Alhambra, the residence of the

"I passed the night in the castle of the regiment of mounted frontiersmen called the Suhayl regiment. All this time the galleys of which we have spoken were lying close by." It seems likely that this castle (Ḥiṣn ar-Rābiṭah) is the one now known as Fuengirola Castle. It stands on a high hill overlooking a river. The town of Fuengirola was known as Marsā Suhayl, the central port of the district. The castle has been much restored and today is but a shell of what it must formerly have been. But its great tower over the entrance gate and its typically Moorish right-angled entrance have a quality of masonry and a similarity of style comparable with the great Marīnid monuments of Gibraltar, and in particular the "Tower of Homage." From this lofty spot at dawn Ibn Baṭṭūṭah would have seen the luxuriant coastal plain and the sandy beaches stretching away to Malaga.

The following day Ibn Baṭṭūṭah reached Malaga (Mālaqah) by horse in the company of his host. He was most impressed; "One of the largest and most beautiful towns of Andalusia. It unites the convenience of both sea and land, and is abundantly supplied with foodstuffs and fruits. I saw grapes being sold in its bazaars at the rate of eight pounds for a small dirham, and its ruby-coloured Murcian pomegranates have no equal in the world. As for figs and almonds, they are exported from Malaga and its outlying districts to the lands both of the East and the West." Ibn Baṭṭūṭah's description can be matched and confirmed by that of other Arab writers and travellers. Malaga, Granada's port and sister to Algeciras, and capital of the district of Raiyuh, had through its history the advantage of being an agricultural centre and a first-class harbour. According to ash-Shaqundī "its environs are so covered with vines and orchards as to make it almost impossible for the traveller to discover a piece of ground which is not cultivated. Its towers are like the stars in the sky—as numerous and shining as bright. It is intersected by a river whose waters only flow during winter and spring, when rolling its precipitous waters through deep ravines and down lofty hills, it empties them in the sea within the very precincts of the city." Malaga was famed far and wide for its figs which were exported to Egypt, Syria, 'Irāq and even India. In Baghdād they were considered as the greatest of delicacies. Ash-Shaqundī travelled along the sea coast from Suhayl to Tīsh, a distance of three days' march, and saw nothing but fig trees, "the branches of which, loaded with fruit, almost touched the ground, so that the little urchins of the villages plucked them without the least trouble." The figs of Tīsh were considered the best. When a Berber was given one and asked how he liked it he replied, "Thou askest me how I like it, and it has all melted down my throat." Another peculiarity of Malaga was its fabrication of permitted and prohibited liquors, the most famous being Malaga wine. The city was also noted for its manufacture of silks of all colours and designs, among the most expensive being the beautiful brocades with the names of Khulafā, Umarā and other wealthy noblemen woven into them. Ibn Baṭṭūṭah mentions the gilded pottery, which was also exported to distant countries.

On his arrival he could hardly fail to have been struck by its giant castle which recalled that of Gibraltar in size and strength, and architectural influences. This Qaṣabah was itself dominated by another fortress, even higher, on the summit of Jabal Fāruh, the mountain overlooking the city. The latter possessed two unwalled suburbs known as Rabaḍ al-Funtanālah and Rabaḍ at-Tabbānīn (*i.e.* of the straw-sellers), possessing hostels and baths. Ibn Baṭṭūṭah's thoughts, however, were turned towards the great mosque (al-Jāmi 'al-A'ẓam) to give thanks for his narrow escape in Suhayl. He entered its spacious court which "is of unequalled beauty, and contains exceptionally tall orange trees," a feature of many Moorish mosques of Spain. He found the Qāḍī sitting there along with the doctors of the law and the

principal inhabitants, all of them engaged in collecting money to ransom the ten horsemen who had been taken prisoner. Ibn Baṭṭūṭah said to the Qāḍī, "Praise be to God, who hath preserved me, and hath not made me one of them." He then recounted the story how they had left for Malaga before him. The Qāḍī was very surprised and sent Ibn Baṭṭūṭah a hospitality gift, as also did the preacher of Malaga.

Ibn Baṭṭūṭah continued on his journey to Granada going first to the town of Vélez (Ballash) twenty-four miles to the east. It was a fine town, a little inland from the sea. It possessed a magnificent mosque and an abundance of vines, figs and fruit trees. Then the Moorish traveller turned north into mountain country to Alhama (al-Ḥammah), a smaller town with an elegant mosque. Its name indicated that thermal springs were located in its vicinity. These could be found on the banks of the nearby river and there were separate bath houses for men and women. Al-Ḥammah is described by al-Idrīsī as having, on the summit of a mountain, a castle of massive proportions. The hot waters were of such fame that sick people from all parts of Andalusia visited the town and stayed there until their diseases were cured. The inhabitants of Almeria used to visit it frequently in spring. Gypsum was locally quarried and exported for building purposes.

In due course Ibn Baṭṭūṭah reached the city of Granada (Gharnāṭah), "the metropolis of Andalusia and the bride of its cities. Its environs have not their equal in any country in the world." He reckoned the suburbs, bisected by the river Shannīl, as extending for some forty miles and was impressed by the manner in which the city was surrounded by "orchards, gardens, flowery meads, noble buildings and vineyards." The glorious setting of Islām's last great cultural centre in Spain with the snow-clad mountains beyond had been the inspiration of countless poets and writers before him. It was given the name of ash-Shā'm (Damascus), perhaps because of its similarity to the Syrian capital in its abundance of brooks and trees. Ibn Baṭṭūṭah left it to others to describe its appearance; in Maqqarī's history, for example, one may read of its "Qaṣabah with high walls and strong buildings and a river which intersects its markets, streets and houses, supplies with water its baths and mills inside and outside the walls, and winds through the gardens and orchards of its meadow."

The Sultan of Granada, Abu'l Ḥajjāj Yūsuf, was ill at the time and Ibn Baṭṭūṭah did not meet him. However, the Sultan's mother heard that the famous traveller was in the city and sent him some gold dīnārs to pay for his expenses. Perhaps the Sultan's illness prevented the visitor from seeing the great Red Palace (the Alhambra), the wonder of Moorish Spain. He makes no mention of it, and we can only assume that he never entered the splendid Gate of Justice, or climbed its "Tower of Homage" or meditated in the Court of the Lions or wandered in the enchanted gardens of the Jannat al-'Arīf (the Generalife). The Moroccan traveller's happiest memory was perhaps the 'Ayn ad-Dama' (the fount of tears), the beauty of which entranced him, and its hill "covered with gardens and orchards has no parallel in any other country."

Ibn Baṭṭūṭah had forgotten the militant intention which had inspired him to undertake his journey. He took the opportunity to meet a number of the distinguished scholars and men of letters of Granada, including the highly esteemed Qāḍī Abu'l Barakāt Muḥammad al-Bala'ba'ī. Ibn Baṭṭūṭah met the latter in the garden of the Faqīh Abu'l Qāsim Muḥammad, with whom he sojourned two days and a night. Whilst there Ibn Baṭṭūṭah told them of his travels and Ibn Juzayy, who was also present, recorded the names of the important personages he had met. Ibn Baṭṭūṭah also visited the principal Shaykh, who was also the superior of the Ṣūfī orders. He spent a few days in the hermitage (zāwiyah) of the Shaykh outside the city

itself, and the learned man took him to visit the hospice built on the hill known as the "outpost of the eagle" (Rābiṭat al-'Uqāb), some eight miles from the city, near the ruined town of Ilbīrah (Elvira). Ibn Baṭṭūṭah also visited the hermitage of the Faqīh, Abu'l-Ḥasan 'Alī, known as " the hermitage of the bridle" (al-lijām). This was located in a suburb of Granada called Najd adjoining "the mountain of the ingot" (Jabal as-Sabīkah).[1] Mystic orders were common in Granada as elsewhere in Andalusia, and amongst them Ibn Baṭṭūṭah met a company of Persian *Fuqarā* who had made their home in Granada because of its resemblance to the uplands of Persia. They were a remarkable collection of men, having come to Granada from different countries of the East.

We do not know how long Ibn Baṭṭūṭah spent in Granada, but he seems to have returned to Malaga by the route by which he had come. From Malaga, instead of following the coast, he struck along the mountain ridge, possibly to avoid the danger of capture by Christian raiders. He reached the town of Dhakwān (the modern village of Coin) where there was a fine fortress and an abundance of water, trees and fruit. After reaching Ronda he retraced his steps to Gibraltar, passing en route the village of Banī Riyāḥ[2] where he was entertained by the hospitable Shaykh Abu'l-Ḥasan 'Alī. At Gibraltar he embarked on the same vessel as that from which he had first landed in the peninsula. His various adventures over, he once more set foot in Africa at Ceuta.

The purpose of his journey to Spain had become increasingly suspect. What was it that made him change his original intention to cross the Straits in order to fight for his religion in the holy war? Was it just a passing whim? Had the wanderlust of seeing new lands blunted his initial keenness? Or had he seen with his own eyes that al-Andalus was a doomed country and that it was only a matter of time before the might of Gibraltar, the wealth of Malaga, and the culture of Granada would be destroyed or pass into Infidel hands?

Almost immediately upon his return to Morocco he decided to travel again, and after a few months spent in Ceuta, took the road to the south on a journey which led to the great Negro kingdoms of the Niger. He crossed the silent monotony of the western Sahara, whose thirsty wastes had unleashed the Almoravids and the Marīnids. But the desert flame had burnt low. There was no second Yūsuf bin Tāshfīn to arise to rescue the Muslims of Spain. Their fate depended on their own resources and their citadels. Desert men had built their walls, but no one knew whether their defenders, decadent and alone, could face the onslaught of Christian zeal.

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[1] The Alhambra is built upon this mountain. [2] Perhaps the village of Banarrabá between Ronda and Gibraltar? Probably derived from Ibn ar-Rabāḥ, but a corruption in the text is possible.

Mail-clad Assyrian archer, shooting from behind a siege-shield, held by a spearman. (*R.G.S. No. 1: 60·5 cm. high*)

Assyrian soldiers escorting Chaldaean tribes to captivity. (*R.G.S. No. 5: 40 cm. high*)

Persian auxiliary bowmen. (*R.G.S. No. 7: 41 cm. high*)

Assyrian soldiers escorting Chaldaean tribesmen and women as prisoners. (*R.G.S. No. 6: 40 cm. high*)

Babylonian tribesmen marching through palm groves to surrender. (*R.G.S. No. 4: 41 cm. high*)

Assyrian guardsman with heavy shield. (*R.G.S. No. 8: 68 cm. high*)

THE ASSYRIAN SCULPTURES IN THE COLLECTION OF THE ROYAL GEOGRAPHICAL SOCIETY

R. D. BARNETT

THE SOCIETY'S COLLECTION of eight fragments of Assyrian sculpture has a certain historical connection with the Society. They appear to have all belonged originally to Colonel (afterwards Sir) Henry Creswicke Rawlinson, famous as the decipherer of the cuneiform inscriptions, who was twice (1871–2 and 1874–5) President and a Vice-President of the Society, and are stated to have formerly ornamented his library. After the death of his eldest son, Henry Seymour, General Lord Rawlinson, in 1925, they were presented to the Society by Lady Rawlinson in memory of her husband. Attention was first drawn to them by Professor Ernest Weidner of Graz in Austria, who in 1935 began a systematic publication of the fragments of the Assyrian palaces dispersed over the various museums and collections of Europe and Asia.[1]

Rawlinson's fragments come from the Assyrian palaces at Nineveh, either from the south-west palace, built by King Sennacherib (705–681 B.C.), known from the Bible as the opponent of Hezekiah of Jerusalem, or from that built by Sennacherib's grandson, Ashurbanipal (668–626 B.C.), the last of the great Assyrian rulers, on the same site a little to the north. Rawlinson's connection with the re-discovery of Assyria was very close, and in the excavation of the palaces in question, though not in their discovery, he may be said to have played a leading part. After distinguished military service in India and Afghanistan, he was in 1843 appointed Political Agent of the East India Company in Turkish Arabia, and in the following year was made Consul at Baghdad, finally being promoted to Consul-General in 1851. In this position he was able to support, and follow to the fullest, Layard's short career of discovery and excavation of the Assyrian palaces at Nimrud, and especially that of Sennacherib at Nineveh, from 1846–50. When the Trustees of the British Museum, who had taken over the excavations, sent out H. Rassam, Layard's ex-assistant, to renew the work of excavation, they requested Colonel Rawlinson to accept general control and supervision of the work; Rawlinson duly undertook this task, as well as he could from a distance, till Rassam retired from the field in spring 1854. In 1853, however, a new party appeared on the scene, in the form of a private society calling itself the Assyrian Excavation Fund, which employed as its excavator a geologist named William Kennett Loftus, assisted by an artist, William Boutcher. After negotiation, an agreeement was reached between the Fund and the British Museum, by which Loftus and Boutcher, from 1 October 1854, were to work for the Museum, again under the authority and supervision of Colonel Rawlinson. Their discoveries, however, and those of Rassam, of fine sculptures were so rich that the Museum, by lack of space, was constrained to order Rawlinson to exercise rather sparingly his right of selection of sculpture to be brought home. Rawlinson accordingly ordered Loftus in February 1855, before closing down, to select 40 or 50 marbles for the Museum, then some for the French, then some for the Prussian Government, then (on certain conditions) to offer some of the remainder to a Mr. Hector; the rest were to be offered to "private parties." It is apparent that at this

[1] See E. F. Weidner, 'Die Reliefs der assyrischen Könige,' Berlin, 1939.

stage Rawlinson felt himself justified in taking some samples of the unwanted pieces for himself. These are those which are now in the Society's collection. Reliefs 4, 5 and 6 come with great probability from Room V, the "Babylonian Room" of Ashurbanipal's palace. The walls of this room were lined with sculptures showing Ashurbanipal's campaign in 650 B.C. in Babylonia against his rebellious brother, Shamash-shum-ukin, and illustrating the latter's surrender and that of the Chaldaean tribesmen, set amid a conventional riverside landscape characterized by palm groves. To judge from their dimensions, reliefs 4–6 could easily have come from the bottom register of such a lost slab from this room, details of which are missing, and which probably showed the surrender of the Chaldaean tribes. Relief 7 is from a top register apparently joining another slab in the British Museum; it depicts a march-past of bowmen wearing feather headdresses. They are probably Persian tribesmen, called in by Ashurbanipal to aid him against the Elamites, for we know from later times that Persian soldiers wore such feather-shaped headdresses. Perhaps this slab is from Room I, in which was shown the defeat of the Elamites beside a town with a ziggurat or temple-tower of many terraces.

Relief 8, showing a bare-headed soldier bearing a lance and large shield, is part of a fine series from Sennacherib's palace represented partly at the British Museum, partly in Berlin, in which, in figures of approximately life size, a procession of priests and guards, headed by the king, is shown winding its way ceremoniously to the temple of Ishtar close to the palace.

The remaining small slabs, 1–3, cannot be ascribed very certainly to any particular room, being very similar to many such groups of soldiers in siege-scenes.

The Society also possesses a fragmentary gypsum slab bearing five lines of Assyrian cuneiform inscription.[1] This is part of the description of the decoration of the royal palace of Sargon II, king of Assyria (722–705 B.C.), built at Dur-Sharrukin, modern Khorsabad, 10 miles north of Mosul, Iraq. The text was originally inscribed on a threshold of the palace and other examples of the full text are known.[2] (*Photographs between pages* 196–7.)

The text and translation of the Society's inscription which was received as part of Lady Rawlinson's bequest in 1925 is as follows:—

TEXT

[*ni-bit-s*]*u* É.GAL.MEŠ KA.AM.SI .^{GIŠ}GAL . . .
[^{GIŠ} *m*]*u-suk-kan-ni* ^{GIŠ}*eri*$_4$*-ni* ^{GIŠ}ŠUR.MAN . . .
[^{GIŠ} *dup-ra-n*]*i* SEM.LI *ù* ^{GIŠ}*bu-uṭ-ni* . . .
[*a-na mu-šab šarr*]*u-ti-ia kir-bu-uš-šu ab-ni-ma* . . .
[^{GIŠ} *eri*]$_4$*-ni* GAL.MEŠ *e-li-šin*[3]

TRANSLATION

1. "[. . . .] its work. palace-suites of [*i.e.* decorated with] ivory, boxwood.
2. [walnut, j]aǧ-wood, cedar, cypress
3. [junip]er, pine and pistachio
4. [for the dwelling of] my royal person I built within it and
5. [I stretched] over them huge beams of [cedar-wood]."

[1] The translation and transliteration of this text are by Mr. D. J. Wiseman.

[2] *e.g.* H. Winckler, 'Die Keilschrifttexte' Sargons,' pp. 160–2, Pl. 33–6. Leipzig, 1899.

[3] The restoration of the signs on the broken left edge of the slab as at present displayed are fictitious.

THE STUDY OF THE GEOGRAPHY OF DISEASE

A. LESLIE BANKS

THE STUDY OF THE GEOGRAPHICAL ASPECTS of disease dates back to the earliest of written records. I do not need to remind such a gathering as this of 'Airs, Waters and Places' or of the other writings of classical times. Even here, however, there are still unsolved problems, as I was reminded recently when I was asked to express a medical opinion on the Plague of Athens recorded by Thucydides. For what it is worth my opinion, and that of my colleagues, was that this epidemic was one of smallpox.

Until comparatively recently the relationship between locality and disease was a subject of interest to many practising physicians, but the scientific developments in medicine in the nineteenth century, and especially in the field of pathology, led to the increasing absorption of the interests of medical men in morbid anatomy and histology, bacteriology, and later virology. You will, of course, be familiar with the gibe that a specialist in medicine has become one who knows more and more about less and less, but it is, I think, true to say that both clinicians and research workers became preoccupied almost exclusively with the morbid processes occurring within the human body, while the epidemiologists tended to concentrate on the case to case spread of infectious diseases.

The last fifty years have seen the most remarkable changes in the effectiveness of our methods of controlling diseases and the time has come when members of the medical profession can no longer work in isolation, for the problems of the future are rather those of communities than of individuals. Tuberculosis, for example, now depends for its final eradication on action over a broad front, for the medical measures by which it can be controlled are becoming fully understood.

We now live, in effect, in two worlds. There is the smaller, highly industrialized, wealthy, literate, and relatively secure type of community familiar to us in western Europe, the United States of America, and certain other countries. There is also the much larger part of the world, composed of countries still in the early stages of development, and mainly rural, where the results of the control of the great killing diseases of infancy, childhood, and early adult life, have yet to reach their maximum effect. Malnutrition, poverty, and ignorance have also to be contended with. If we are to discuss the geography of disease we must first recognize that the problems are vastly different in these two parts of the globe.

It is my purpose, therefore, in opening this discussion, to sketch the broad background, and to discuss certain current problems, in the hope that we may reach agreement on the possibility of cooperation between geographers and medical men and if so in what direction we should proceed.

Historical review

It would be broadly true to say that up to Elizabethan times the pattern of disease was one throughout the world. A physician trained in Baghdad or Teheran could practise medicine equally well in Paris or London, making due allowance, of course, for variations due to climate, because the natural incidence of disease was uncontrolled by man. War, pestilence, and famine, were the dominating factors. The fearful

mortality in infancy and childhood, together with the disabling and killing diseases of early adult life, resulted in a biological balance quite unlike that to which we are now accustomed. True, birth-rates were high, but death-rates were also high, especially in early life, and in epidemic or famine years were even higher than the birth-rates, so that population growth was at times at a standstill or even declined. At best it increased very slowly.

The picture was therefore one of early death, with many diseased adults and few old people. It must, indeed, have been very similar to that seen in the more backward parts of the world today, where not one but five or six different pathological conditions may affect a single individual. Protein and vitamin deficiencies, parasitic infestations with worms of various kinds, malaria, tuberculosis, the venereal diseases, together with skin lesions and vermin, made the picture a depressing one. Nor were these conditions confined to the masses, for they may be found in the records of the aristocracy and even of the royal families.

Here also may be found interesting subjects for study. When John Caius, the great physician of Tudor times, included the word "Wallicum" in the list of exclusions from entry to Gonville and Caius College, Cambridge, was he referring to Welshmen? was it a misprint for gallicum and therefore a reference to the morbus gallicus? or did he mean a eunuch? For that matter, were the "sorre legges" of Henry VIII varicose ulceration or syphilitic ulceration? and what precisely was the sweating sickness?

This grim picture, with its expectation of life rarely exceeding nineteen years from birth, and sometimes considerably less, began to change some three hundred years ago. A useful landmark in this respect is William Harvey's discovery of the circulation of the blood in 1628, and the flow of scientific knowledge throughout that century, especially in the reign of Charles II with the foundation of the Royal Society of London, is sufficiently well-known. It was, however, the discovery of the New World that was of most significance, for the increasing trade brought wealth to the maritime countries of western Europe, and the rising social standards did more to reduce the great epidemic diseases than any medical advances of that time. The failure of the plague to return to this country after 1665 is a good example, for the stone houses built after the Great Fire of London, the substitution of carpets for rush coverings on the floors, even the increased cleanliness of the people for social reasons, all were beneficial in this respect.

By the end of the seventeenth century scientific curiosity had extended to enquiries into the possibility of treating or preventing epidemic disease. John Graunt, Sir William Petty, and others, were beginning to measure life statistically, and it was not long before the realization grew that it might be possible to extend its span. This was the more desirable because the wealth of the country was becoming dependent on the skill of its craftsmen. The following century saw the setting up of hospitals and dispensaries, together with various scientific discoveries in the medical field, such as those of Lind on the scurvy and Pringle on the advantages of improving ventilation in barracks and gaols. Finally Jenner's discovery in 1798, that cowpox prevented smallpox, marked the real turning point in the prevention of disease in the mass.

I need not dwell on the results of the Industrial Revolution, but I would point out that the pattern of disease changed for the worse with the rising numbers of the population in the poorer quarters of the cities. A study of demographic and health conditions of the late eighteenth century is badly needed.

Our early Victorian ancestors were spurred to action by three main factors: fear,

especially of the cholera, altruism, and the economic need to preserve the life of skilled work-people. Such good progress was made throughout the nineteenth century that at the end of it water supplies, sewage disposal, the purity of food supplies, housing, and the segregation and treatment of infectious disease, had made tremendous strides. The birth-rate was still high, but the death-rate was falling. Above all, the social conscience was awakened, and the way was clear for the remarkable changes of the present century.

The present position

The first half of the twentieth century has witnessed more dramatic advances in the medical and social fields than at any other time in our history. We, in this country, have experienced three major wars within fifty years, each of which has resulted, directly or indirectly, in medical improvements. The Boer War, with its deaths from disease, and especially from enteric fever, together with the startling disclosure that many of the volunteers from the industrial cities were physically unfit to serve, acted as the spur. Within a few years of the ending of that war there began the introduction of medical and social legislation, including the School Medical Service, and culminating in the so-called Welfare State after the Second World War. Comparable developments have occurred in a number of other countries, where the vital statistics show similar improvements to our own and, indeed, are sometimes better than those to be found in Britain.

Perhaps the most remarkable change of all is illustrated by the fact that within my own lifetime, little over fifty years, the expectation of life from birth in England has increased by twenty-five years for men and thirty years for women. The biological balance in this and similar countries is now one of relatively few but healthy children, healthy adults, and an increasing number of old people.

The contrast between such favoured societies and other parts of the world is sharp indeed, for the expectation of life from birth remains at about thirty on the average in many parts of the world where the ancient disease pattern has undergone little change.

It would simplify matters considerably if we could make a sharp distinction between urban and rural communities, or between the industrialized and non-industrialized parts of the world. Unfortunately, it is not as simple as that. So many other factors, including nutrition, play their part. Worthington drew attention to something of this kind when he said "A visitor . . . cannot help but be impressed by the influence on native health and physique of good regular food and medical attention during a contract for work on the Rand Mines . . . the contrast between the incoming and outgoing labour force must be seen to be believed" (Worthington, 1958).

Although it is not strictly relevant to the subject of this lecture, I would like to suggest that more attention might be paid to the "fringe" areas where different cultures meet, and also to those islands which form melting pots for the fusion of different racial groups. Field studies in such areas, made after careful preliminary preparation, could be most revealing. In this connection I have recently had a letter about a medical man who has collected information, of great potential value, about the incidence of disease and the living conditions of families in an island in the South Pacific and who now wants help in analysing it. I must, however, be careful not to stray too far from the subject and I would like now to discuss some of the major medical problems, firstly of western countries and then of other parts of the world.

Medical problems in the "western" world

(*a*) *Cardiovascular disease.*—The principal cause of death, in our type of society, is attributable to a disaster affecting the blood vessels of the brain or heart. Thus, there were in England and Wales in 1957 some seventy-six thousand deaths from coronary disease (Ministry of Health). These deaths tend to be a manifestation of the later age-groups, well-fed, taking relatively little exercise, but living under considerable emotional and intellectual stress.

One would expect to find a profitable field of study in the comparison of the incidence of cardiovascular disasters in, for example, negroes and white men working and living under similar conditions, and between negroes in Africa and in North America. One would expect also to find industrialized communities in India sufficiently similar to those elsewhere to enable comparisons to be made.

These studies would, however, encounter the difficulty that so little is yet known of the genetical differences, if any, of various races in relation to pathological conditions of the cardiovascular system. My own feeling would be that this field is too complex for any but long-term and well-organized studies.

(*b*) *The cancers.*—Cancer, including leukaemia, accounted for more than 18 per cent. of all deaths in England and Wales in 1957, and it is now the second most important cause of death. This disease has the somewhat dubious advantage that it appears primarily in certain well-defined areas of the body, such as the larynx, the lung, stomach, rectum, breast, and body or cervix of the uterus. Many isolated facts are known concerning predisposing environmental causes of cancer. Paracelsus, for example, described cancer of the lung in the miners of radio-active ores in the sixteenth century (Ministry of Health, 1958) and certain malignant tumours of the skin and scrotum were early recognized to be due to the action of external irritants.

Cancer is a disease that lends itself well to study by area and social class, and it is possible to separate certain broad groups and their related conditions, such as cancer of the lung and air pollution, leukaemia and ionizing radiations, and cancer of the liver and metabolic deficiencies.

The International Union against Cancer has an active committee on geographical pathology, and both the World Health Organization and the Public Health Committee of the Western Union are investigating the problem. The National Cancer Registration Scheme now being developed in Britain on a regional basis will provide complete information about all cases attending hospitals within the National Health Service. The yearly incidence of all forms of cancer is about 3 per 1000 of the population, with a total of some 94,000 deaths in England and Wales in 1957. There is no doubt that a number of these deaths could have been prevented, and this is a subject, *par excellence*, for combined action.

The Report of the Ministry of Health for 1957 (*op. cit.*) has an important section devoted to these conditions, and gives a valuable lead in possible lines of research. "Apart from the items of information generally sought in epidemiological studies such as age, sex, occupation, habits, economic status, marital status, parity in the female, and area of residence, items more peculiar to the elucidation of the cancers need to be included, chief of which are: atmospheric pollution, smoking history, exposure to ionizing radiations, and the nature of water supply and soil. To this might be added two others which seem worthy of more attention: blood groups, and mental attitude or temperament." Similarly the statistics suggest that cancer of the stomach stands out as being more subject to geographical determinants than to urban-rural influences (G.R.O. 1957).

It will be noted that many of these lines of research are within the province of a geographer working in association with a medical man. In this connection the work of Dr. Howe of the department of geography and anthropology, University College of Wales, on the distribution of cancer, is of the greatest interest (Howe, 1959).

(*c*) *Diseases of the respiratory system.*—A study of the mortality statistics in various areas of England and Wales reveals that in urban areas respiratory tuberculosis, cancer of the lung, and bronchitis, have much higher death-rates than in rural districts. These diseases are also more pronounced in the large centres of population, *e.g.*, of 100,000 or more, than in those with fewer numbers, while smaller urban areas, with populations of under 50,000, approximate more nearly to rural districts (Registrar General, 1958).

Deaths from respiratory tuberculosis have fallen so sharply (from 25,339 deaths in England and Wales in 1938 to 4784 in 1957) that this disease may now be said to be coming under control. The peak of mortality in tuberculosis of the lungs is now seen in elderly males. Scrutiny of the incidence in Local Health Authority areas shows that there are a few of these where high rates persist, such as Gateshead, Liverpool, Middlesbrough, Newcastle-upon-Tyne, Smethwick and Stockport, and where presumably the pool of infection is comparatively large.

More important, from our present viewpoint, is bronchitis, now acquiring the unenviable title of "the English disease." It is noteworthy that county boroughs in the north-western part of the country have the highest male death rates from bronchitis and cancer of the lung.

This disease causes much disability and distress to its victims, and is one of the leading causes of sickness absence in industry. Thus in 1954–55 it accounted for 11 per cent. of the total days of work lost (Ministry of Pensions and National Insurance). Although there may be a genetical predisposition to the development of bronchitis it is clear that the immediate causes are environmental. There is, I suggest, an important and profitable field of endeavour here.

It might be instructive to prepare a series of maps of some of the large towns in the north-west of England, where bronchitis and other respiratory conditions, including cancer of the lung, are now so rife, and to see precisely how the congestion grew and spread. One would expect, for example, the low-lying and marshy areas, and the valleys, to be those where atmospheric pollution is most to be encountered. Many of these natural conditions are now obscured, but a geographer should be able to say that in such and such an area he would expect to find the optimum conditions for these respiratory diseases.

(*d*) *Other principal causes of death.*—As noted earlier, cardiovascular disease and cancer account for some 70 per cent. of deaths in this country, and diseases of the respiratory system for a further 12 per cent. The next most important cause of death, numerically, is the group of accidents, poisonings and violence, with 4·2 per cent. of deaths. Although there are several important problems involved under this heading, such as accidents in the home and on the road, and also suicide and attempted suicide, they are, in fact, as much social as medical, and here, also, comparative studies of different areas would be informative.

(*e*) *The rheumatic diseases.*—Although the number of deaths from the rheumatic diseases is relatively small the disability is high, and "arthritis" and "rheumatism" accounted for 7·1 per cent. of the total days of work lost in England and Wales in 1954–55. The traditional association between climate and rheumatism, and the ease of comparison between urban and rural influences would, at first sight, make this

seem an ideal subject for field study on a geographical basis. The condition brings out well, however, the difficulties underlying many apparently simple medical enquiries. It is by no means easy always to establish the diagnosis by clinical examination, especially in early cases, and it may be necessary to enlist the help of both radiologists and pathologists before the precise nature of the disease, and its extent, can be established. A field survey may require, therefore, a mobile diagnostic unit such as that set up recently by the Empire Rheumatism Council (Empire Rheumatism Council, 1957). There is no doubt, however, that the special techniques employed by the geographer would be of great assistance in the study of broad regional patterns within which detailed sampling might be carried out.

(*f*) *The psychosomatic diseases.*—I would like to turn now to certain other problems of our type of society, and in particular to those conditions which are aggravated by stress. The so-called psychosomatic diseases include certain affections of the skin and of the digestive tract. The aetiology of these conditions is complex, for they are compounded of genetical and environmental factors.

The skin is the largest organ of the body and it is more exposed than any other to climatic influences. It is often the first also to register signs of dietetic deficiencies. A number of useful papers on the influence of geographical factors have appeared recently, such as that of Clarke dealing with comparisons of skin disease in different climates and races (Clarke, 1951) and geographical aspects of the mortality from melanoma in Europeans (Lancaster, 1956).

Nearer home, Rook's work on geographical variations in incidence and severity of acne vulgaris (Rook, 1957) and his work with Tyser and some of my own colleagues on the atopic syndrome of eczema/asthma/hay-fever (Rook, 1959) are other examples of a renewal of interest in this subject.

A research team, composed of a dermatologist, a geographer, and a statistician, could throw fresh light on many problems about which little is known. Now that better diagnostic facilities are available in all areas under the National Health Service the time has come to put this subject on a more scientific basis, and to study the ecology of a number of skin diseases.

Somewhat similar considerations underlie the aetiology of peptic ulceration, for there are very distinct differences between gastric and duodenal ulcer. A study of the geographical pattern of distribution of these two conditions would, I believe, provide valuable pointers to a better understanding of the various environmental factors which provoke them.

(*g*) *Mental illness.*—The gulf between geography and mental illness would appear to be so wide as to allow of no point of contact, and it is not until one begins to break the subject into its component parts that one sees the possibilities of useful cooperation. Take first mental deficiency. It will be remembered that the Royal Commission on the Law Relating to Mental Illness and Mental Deficiency reported in 1957 and recommended that the term "severely sub-normal patients" should be used when the general personality (covering intelligence and temperament together) is so severely sub-normal that the patient is incapable of leading an independent life. Such patients would include those at present classified as idiots and imbeciles and some of those now classified as feeble-minded (Royal Commission 1957). At the time of writing it is not certain whether Parliament will accept all the recommendations of the Royal Commission, but the Mental Health Bill now under discussion will undoubtedly direct attention to the problem of the mentally defective. It would be of the utmost value to have a survey of the present distribution of these people in the various parts of the country, for it would be of immediate help in

planning relief for them and for their unfortunate families, and it would also provide the necessary data for observing changes in future years. Properly devised such a survey might also throw light on the predisposing causes of some of these conditions.

It is tempting to try to make a case for similar studies in other parts of the mental field, but one must say quite honestly that the time is not yet ripe for this. Psychiatrists would be the first to admit that as regards classification of mental illness their knowledge is far from complete. Certain broad categories can be recognized, and the particular illnesses of certain age groups, especially the adolescent and elderly, are known, but I should be failing in my duty, as I see it here, if I were to encourage geographers to venture far into this relatively uncharted area.

These, then, are some examples of the principal medical problems confronting us in Britain and similar societies today. In a country as small as this, latitude and longitude can have only a minor effect, if any, on the general pattern and we are left with such considerations as urbanization, and industrial and social influences, as the principal factors, together with certain climatic variations, principally in the form of differences in humidity and sunlight.

The geography of disease in the developing countries

When we come to examine the larger areas we find that even within Europe differences in the physical environment become more important. The amount of sunlight, for example, begins to show its effect in various conditions of the skin, such as psoriasis and rodent ulcer, while the parasitic diseases, such as the mycoses, have a different ecology in different countries. To take a simple example, the type of fungus causing the common forms of ringworm may be different in Russia and Britain, and the types of cancer, and the sites affected, may differ considerably in certain eastern European countries from those found in the north and west. Basically, however, the differences in European countries are caused by time rather than by location. By this I mean that the more "backward" European countries display a disease pattern comparable to that of Britain at the turn of this century, with the common infectious fevers still notable for their killing power, while the relatively high infant and child mortality may give a shorter expectation of life. The pattern of life and culture are, however, sufficiently similar to enable detailed comparative studies to be undertaken with profit.

The position is very different when we turn from Europe to other parts of the world. It is now just over one hundred years since August Hirsch wrote that "Medical geography must not become the playground of learned curiosity or romantic natural philosophy. We must have the facts . . ." (Hirsch, 1853). Alas! we still lack the facts only too often. Long-term studies of the physical environment in important parts of Africa, for example, have begun only recently. We are in the odd position of seeing the application, in many parts of the world, of the technical advances in medicine on the control of disease on a massive scale before we have the basic knowledge on which to assess the results. It is rather like looking at our own history in reverse, or, to be fanciful, of suddenly endowing the medical faculty of medieval London with the whole armamentarium of modern medicine, including the antibiotics and insecticides. In some instances it would be more correct to take the analogy back to early Saxon, or even pre-Roman times.

So many things are lacking. Inadequate statistics, both medical and geographical, render intensive and deep research difficult. Racial differences, anatomical, physiological, biochemical, psychological, also exist, but we do not know to what extent these or environmental or nutritional factors predominate in influencing the pattern

of disease. Above all we need long-term studies of the physical environment. The whole field is wide open, but the difficulty is to know where to begin.

Fortunately, some men have not hesitated and the names of Geddes, May, Lee and Sorre spring to mind in the geographical field and Percy Stocks's work on medical statistics. Professor Gilbert very kindly sent me recently a copy of his paper on "Pioneer maps of health and disease in England" (Gilbert, 1958). Those nineteenth century adventurers, some of whom were both medical men and Fellows of the Royal Geographical Society, were faced with even greater difficulties only one hundred years ago. John Snow in London, Robert Baker in Leeds, Dr. Shapler in Exeter and Acland in Oxford, all investigated cholera on a geographical basis although the causative organism, the cholera vibrio, was still undiscovered and modern diagnostic aids were unknown, as were also the means of prevention.

By a happy coincidence I received almost at the same time two papers by another geographer, Dr. A. T. A. Learmonth of the University of Liverpool. One dealt with "Some contrasts in the regional geography of malaria in India and Pakistan" (Learmonth, 1957), and concluded that "there is justification for geographical studies of the differing demographic effects of malaria from region to region, not least at this time when the effects of the abolition of malaria on increasing population growth are becoming manifest in many countries such as Ceylon, British Guiana and parts of India and Pakistan." In a footnote Dr. Learmonth indicated that he had to generalize from very scattered and fragmentary sources. "It is difficult to get a coherent set of laboratory or field data concerning even one species of anopheles." Nevertheless the work was done.

The other paper dealt with the subject of "Medical geography in Indo-Pakistan" and the maps in it are based on the returns given in the annual health reports for the former British India for the years 1921–40. In spite of the inaccuracies of the statistics "collected largely by the hundreds of thousands of illiterate village watchmen, whose duty it was to record them" the claim that, when placed together and only broad patterns examined, useful information can be obtained, is substantiated.

This survey brings out well the possibility that if, and when, malaria is banished the intestinal diseases may become the most formidable problem, and that behind these looms the shadow of tuberculosis, especially with increasing industrialization, accompanied, as it well may be, by poor housing, overcrowding, and faulty nutrition. It does not need a very vivid exercise of the imagination to foresee the transition to the western pattern of disease, provided, of course, that population growth does not out-run food supplies.

Without studies such as these, however imperfect the data on which they are based, the peoples of the countries concerned may find themselves worse off, in the long run, than in the past, for all the evils of urbanization may descend upon them with the same speed that the present changes have done. Already the ancient biological balance has been upset. Death-rates have fallen, often by as much as 50 per cent. by the control of one disease, malaria. Birth-rates, on the other hand, continue to remain high and may actually rise. The expectation of life from birth is rising also and the Demographic Yearbooks bear dramatic witness to these changes (United Nations).

Migration to the towns is already evident in many parts of the world and the areas concerned have neither the economic resources, nor the painfully acquired experience, which enabled countries like our own to survive these drastic changes. Nor have they the time. Whereas we can look back over some three hundred and fifty years to the first Elizabethan Poor Law, harsh though it was, as the beginning

of the stabilizing influence of the State, the time factor for many of these countries is of the order of fifty years at most.

They must, therefore, profit by our experience and it seems to me that we have a duty, however thankless the task may be, to demonstrate the need for balanced development if progress is to be maintained. A recent report on the state of health, diet, and economic conditions of groups of people in the lower income levels in Malaya, for example, brings out well the reasons why the Malay infant, as compared even with the Indian infant, gets a bad start in life. Space will only allow me to quote the concluding paragraph. "There were therefore many influences which went towards the production of this vicious circle—poor diet, poor physique, lack of initiative and energy, resulting in low output of work and lastly the fact that because of their incapacity to handle their own affairs, they frequently did not obtain a reasonable recompense for the work they had done" (Burgess and Musa, 1950).

Other examples which come to mind, this time concerning Africa, are Carothers's impressive work on the African mind in health and disease with his comment that "the African is not asleep, but he does seem to live in that strange no-man's-land 'twixt sleep and wakening where fact and fancy meet on equal terms" (Carothers, 1953).

There is also Worthington's remarkable survey, 'Science in the development of Africa,' at the end of which he is "tempted to reach a broad conclusion that political and economic factors are urging a pace of development which is scarcely compatible with detached survey and study, whereas such study is essential to provide the firm basis for real advance" (Worthington, 1958). Although he resists this temptation, as being perhaps unduly pessimistic, the warning is given.

Lines of Research.

I do not think it is seriously open to doubt that there is a real need for interdisciplinary enquiry into many current problems relating to the geography of disease. First and foremost is the need for accurate data, and secondly for the clear demonstration of the facts. As Dr. Dudley Stamp said in a recent discussion "Whether as geographers or biologists, the first question to be decided is: what are the data available? And the second, what does one want to show? There must be a clear concept from these two angles before we can proceed" (Stamp, 1954).

As I see it there are two sets of studies required, studies in depth and studies on a broad front.

The studies in depth can only be carried out where the information available is both accurate and complete. Then it is possible to take one disease, or a closely related group of diseases, such as the cancers, bronchitis, rheumatism, or the "stress" diseases, and make an intensive study in a given geographical area, such as a city in the north-west of England, or compare an agricultural and an industrial community. With the experience gained by such a trial run or pilot experiment, more ambitious investigations involving closely similar areas such as France, Germany, or Scandinavia, could follow.

As soon as the basic data become suspect this method breaks down, and we must be prepared to cast our minds back to conditions as they existed one hundred or more years ago in this country. In other words we must be content with broad generalizations and fill in the details later. Nevertheless it should be possible to make sufficiently accurate general observations to enable comparisons to be made between the developing areas in one part of a continent and another, or even between parts of different continents. Once a beginning has been made in this superficial

fashion it should be possible to select certain major problems for more detailed investigation.

If the two types of study outlined above are accepted as being desirable the next problem is how to undertake them. Hard experience has taught me that good research cannot be done merely by obtaining large research grants and then looking for research workers. "First catch your hare," as Mrs. Beeton would say. The better thing to do is to create a favourable climate for research for the man who sees a problem that he wishes to investigate. It is, however, necessary to have certain broad principles in mind.

Studies in depth can well be undertaken by one or two people at the young graduate level. Profound technical knowledge of medicine, for example, is not required provided that there is ready access to reliable and experienced medical advice. I am administratively responsible for the statistical services of the Cambridge Medical School and I have been pleasantly surprised at the way young mathematicians and statisticians can adapt themselves to the solving of problems in medical statistics provided that I, and my medical colleagues, are prepared to answer questions and scrutinize drafts of reports.

The base from which such a research worker would operate needs some consideration. Field workers require the stimulus of discussion, and access to recent literature. That is particularly necessary in medicine at the present time, when so many advances are being made at different points, both in human and comparative medicine. My own preference, therefore, would be to establish work of this kind in a university with an active medical school, but much would depend on the nature of the enquiry, and the closeness of the association with the department of geography.

Studies on a broad front require separate consideration. The approach is primarily geographical, in the sense that information is needed especially about the physical environment. Indeed, I understand from my geographical colleagues in Cambridge that one of the most urgent requirements in the developing parts of the world is for long-term studies of climatic conditions, hydrology, and so on. Detailed studies of this kind would be extremely valuable at this time, when large tracts of land are being made habitable again by the control of the insect vectors of disease. Here, also, I do not believe that it is possible to set up a research "Department", staff it with experts, and then await results at the end of the conveyor belt. Continental or even world maps may appear, and learned text-books with the prefix "Global" to the title, but the amount of effort would not necessarily be commensurate with the results, which are likely to be pedestrian.

There are, in my opinion, better alternatives. One is to encourage a man, or men in different areas, who have already proved their worth by a pioneer effort, to devote their time to research in an area already known to them. This would require both money and also some central sponsoring body. Another alternative is for a group of men to agree to take part in a research project to which each contributes from his daily work. This takes some organizing, but it can be done, and the results can be most satisfying. I can speak from personal experience, for I am chairman of a Steering Committee investigating the problem of sudden deaths in infancy. Those taking part include coroners, and their officers, clinicians, pathologists, bacteriologists, virus experts, medical officers of health and health visitors, and statisticians. For the first three years we operated in London and East Anglia without any grant, and only pressed for this when expensive and intensive virus research work became necessary (Banks, 1958).

Although the approach to problems in the less-developed areas would be primarily environmental, their elucidation would call for multi-disciplinary action. Here it is necessary to be frank. As a result of various discussions I have sensed a feeling of suspicion as between some geographers and medical men, based on ignorance of the contribution that each can make. Some clinicians, by the nature of their work, are unable to visualize disease patterns on an areal basis, whereas the training of the geographer encourages him to think in terms of maps as readily as the mathematician uses symbols. Geographers, on the other hand, may under-estimate the complexities of a subject which is still an art rather than a science. In spite of all aids to diagnosis, in spite of all the statistics, the final test of the first-class practising doctor is that sixth sense which tells how the individual patient before him will respond. How well I remember one of my former surgical chiefs saying, against all the data, "Don't touch him. If you do he'll die."

It is therefore essential to recognize at the outset the limitations of the two parties. Medical information can best be interpreted by doctors. The geographer's part would be to examine all the environmental influences. The two sets of facts would then require to be assessed jointly, and portrayed cartographically by the geographer.

The combination of medicine and geography, aided where necessary by statisticians, economists, and anthropologists, should provide the right background for those already working, often in isolation, in the field.

Conclusion

I would suggest, therefore, that the first essential is to provide a favourable climate for research. If it were known, for example, that a National Committee, composed of geographers and medical men, had been set up to encourage and coordinate research in the geography of disease, it would be a tremendous encouragement to a number of men now working independently. I suggest a committee, rather than a society, for one has seen too many of the latter flag and fail after a short initial burst of energy, whereas the first duty of a committee would be to explore the subject. It might be claimed that this sort of activity is best left to universities, but here, also, my experience has been that dons are now so heavily loaded with routine teaching and administration that any spare time they may have must be given to their own special research interests. The committee might decide subsequently to establish a Research Institute, or to seek funds to endow a Chair, but this would be a later development.

To sum up, there is, in my opinion, a most important field of study in the geography of disease, both in intensive investigation of an individual disease, or groups of diseases, where accurate data are available, and also in the broader study, in the developing countries, of the pattern of disease and the influence of the environment. There are opportunities for true research, in addition to mere fact-finding surveys, and I would urge that a National Committee, composed of geographers and medical men, be set up to enquire further into the matter.

"For if one knows all things well, or at least the greater part of them, he cannot . . . commit mistakes, as is likely to be the case, provided one had not previously considered these matters" ('Airs, Waters and Places').

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DISCUSSION

Afternoon Meeting, 19 January 1959

The CHAIRMAN (Professor E. W. Gilbert): This afternoon we are to hear a paper on "medical geography." That term has been in use in this country for the last sixty or seventy years. It was used in Germany rather earlier, at least as early as 1853. But in England the term "medical geography" was preceded by "medical topography" which goes back to the early years of the nineteenth century. There is thus a long tradition of cooperation between the two disciplines of medicine and geography, but in recent years this association has perhaps not been as close as some of us would wish.

Professor A. L. Banks will speak on "The study of the geography of disease." He holds the chair of human ecology in the University of Cambridge and I believe it is the only chair with this title in Britain. Two or three years ago he read to the Society a valuable paper on "Trends in the geographical pattern of disease," which was printed in our *Journal* in June 1956, and today's paper can be regarded as a continuation of that earlier address. I know that he is going to plead for closer coopera-

tion between medicine and geography—and other studies—in this important field of the geography of disease. We shall listen with great interest to his analysis of the subject and his proposals.

Professor Banks then read his paper

The CHAIRMAN opened the discussion by showing a slide of Dr. John Snow's map (1855) of deaths from cholera in the Broad Street area, London, in September 1854.

I now call on Dr. A. T. A. Learmonth, who has already been mentioned in Professor Banks's paper. He is a lecturer in geography in the University of Liverpool, and has recently returned from two years' work in India; he will show us a few slides in connection with his remarks.

Dr. A. T. A. LEARMONTH: Mr. Chairman, ladies and gentlemen. First I must thank Professor Banks for an address of tremendous sweep offering, surely, enough stimulus to keep whole teams of researchers busy for a decade or more. I am grateful to the Royal Geographical Society for giving me this opportunity to contribute to the discussion and to the University of Liverpool for sending me to do so.

In my study in breadth—and it is in breadth—of medical geography in the subcontinent of India and Pakistan, my aim so far has been to show that there are disease regions in the sub-continent, regions where the association of diseases is distinctive; to delimit them positionally; and to analyse their underlying causes in the light of both geographical and medical literature. I have enjoyed medical cooperation from Professor T. H. Davey and others in the Liverpool School of Tropical Medicine, but not so far actual collaboration with a medical research worker. I would plead, in connection with this type of broad work, that there is some purpose in making even my fellow geographers, and perhaps I may add planners, aware of such disease regions at a time when the new republics of India and Pakistan are carrying out all-round development programmes. Development presents differing problems regionally from the point of view of health, as in other ways, and geographical techniques and method have sometimes a contribution to offer. I am distinguishing there between particular techniques or tools, often cartographic, and the broad method which Professor Banks has characterized as the habit of examining distribution patterns on maps in order to discover regional patterns which may prove to be related. Some of this audience will remember both the broad method and the new techniques that Dr. Arthur Geddes used some years ago in delimiting six types of demographic regions of India, largely related to disease patterns. Some of this work was published by the Society in the *Geographical Journal* in 1941 and some the next year in the *Geographical Review*.[1] Geddes's findings were suggestive enough to suggest that a specific medical geographical study was justified and perhaps I can just illustrate a particular technique used in my own published work. (*Dr. Learmonth showed some slides which he describes below.*)

Sometimes, it is useful to hold in one's mind three variables in connection, say, with the distribution of deaths from cholera:[2] firstly, the areal distribution of deaths, both in terms of the mean incidence and also the variability from year to year. All the important health data for the period between the wars for British India were processed in this way to divide the mean incidence into high, medium and low categories, decided after examination of the scatter, or dispersion, of the values. And similarly, variability from year to year is characterized as high, medium and low. This gives a simple, ninefold key in which high mean incidence is demarcated by denser shading, and the degree of variability by the direction of shading. The great endemic homes of cholera, mainly in deltas, are distinguished from more epidemic areas, say, in the middle Ganges. More sensitive delimitation could be attained in a study in depth of cholera as distinct from a broad study like that actually carried out. Now this map is

[1] Geddes, A. "The population of India; variability in change as a regional demographic index," *Geog. Rev.*, **32** (1942), pp. 562–73.

[2] See Figure 9 in Learmonth, A. T. A., "Medical Geography in Indo-Pakistan," *Indian Geogr. J.*, **33** (1958), pp. 1–59; or *Ann. trop. med. & Parasitol.*, **48**, pp. 345–8.

one example of the method applied on the sub-continental scale. There are about two hundred units for the whole of British India on the map.

Turning to a map of cholera for the old princely state of Mysore, there are about a hundred of the smaller administrative units called *talukas* for a country then about the size of England. The units are still large, but much better than those on the map of India we looked at. It is clear enough that even this not too close network is already permitting one to get much nearer to the two areas of high cholera incidence; high and variable cholera incidence related in fact to two river basins: the Tungabhadra in the north, and Cauvery in the south. And also away from the very high incidence, there is the nearest approach in Mysore to an endemic area which has developed in the last thirty years in a great area of canal irrigation east of Mysore City. It is nothing like the great endemic home of cholera, say, in the Bengal Delta, but relatively speaking, by local standards, it is so.

Now this map, imperfect as it is, could be a spring-board for a study in depth, at least to a moderate degree of intensity, going beyond this first approach to an examination, or instance, of the cholera year in relation to the climatic year. This would build on the medical work of Sir Leonard Rogers and others, but carrying with it our geographical concept of taking the data as close to the ground and to the environmental conditions as we possibly can.

Now many medical men, of course, do think in terms of regional patterns. Among the malariologists are Bentley, Strickland, Gill, Christopher and Sinton, of the many from India alone; and many workers in cholera from Sir Leonard Rogers to Satya Swaroop. And thinking of atlases of disease, Sir John Megaw, May and Rodenwald have all contributed.

I have here an example which may not be familiar to my geographical colleagues. It is on three scales. Firstly, for the whole of what is now India and Pakistan—a quite old map from census figures of deaf-mutism. The heaviest distributions are suggestive mainly of mountain areas; it is a distribution related to goitre. Now, if we take this on a moderate scale, here is a map of the old United Provinces; there are some areas in the Plains also which are seriously affected by goitre. Then, taking it down to a quite intimate scale of study, we can see in the neighbourhood of the Gandak and the Gogra rivers, areas of quite local high incidence of goitre related to alluvium rich in lime.[1] This is a beautiful piece of mapping, culled entirely from the medical literature, and there are many other examples. Without losing confidence in our own contribution, perhaps we geographers can also walk humbly.

Dr. Melvyn Howe from Aberystwyth is unable to be with us, but he has kindly sent some slides of his new maps of cancer in Wales. I have chosen two from his complete series of maps to show two contrasting distribution patterns: the first map, of cancer of the lung, shows standardized mortality for males for a short run of recent years; there is a strong correlation with industrial South Wales, and there are also high pockets up in the north, mainly in the more urban coastal belt. Now in contrast, cancer of the stomach, either for male or female, gives a largely complementary distribution, and with a great emphasis on especially the north of Welsh-speaking Wales, but in the case of the female distribution not very unlike Welsh-speaking Wales as a whole. I cannot analyse, as Dr. Howe can, his first broad correlations, both positive and especially negative correlations; he can already dismiss a number of the factors suggested for study in the Ministry of Health Report which Professor Banks was quoting. This study from home clearly could be a step towards a study in depth of the kind that we have been considering tonight. I welcome Professor Banks's suggestion of a National Committee; I hope something concrete does come of the discussion; and for myself I shall gladly do anything I can to further the idea of inter-disciplinary research—if that is judged useful—and I know that my chief, Professor Steel, and my colleagues in Liverpool, will do all they can too.

[1] Stott, A., *et al.* "The distribution and causes of goitre in United Provinces," Part I, *Indian J. Med. Res.*, **18** (1930–31), Part IV, **21** (1933–4), pp. 649–54.

Dr. RICHARD DOLL (London School of Hygiene and Tropical Medicine, Deputy Director of the Medical Research Council's Statistical Research Unit): I would like to add a few words in general support of what Professor Banks has said. The present time is peculiarly suitable for developing research of this combined type: firstly, there still are great environmental differences throughout the world which we have had ample reason for believing to have contributed to the causation of disease. These conditions are, however, rapidly changing and it will not be so very far in the future before we shall have to contemplate a relative uniformity throughout the world in environmental conditions. The time is pressing if we want to pick up the effects of those conditions which one suspects are responsible for remarkable differences in incidence of some of the important diseases at the present moment, such as cancer. We know, for example, that there are some forms of cancer which are almost limited to some areas of the world. Such as, for example, cancer of the back of the pharynx which is common in Malaya and which is extremely rare elsewhere; or the forms which are common in Britain—say cancers of the large bowel—and which are extremely rare among the native South Africans and in Iceland and Finland.

But it is not only because environmental conditions are changing that the time is now ripe for a study of disease distribution throughout the world. The second reason is that we have recently developed improved tools for determining the distribution of disease. As Professor Banks has pointed out, it is not perhaps always appreciated by non-medical people (it certainly is not always appreciated by medical people) that our present estimates of disease distribution are frequently extremely rough. It has not mattered much in the past when we have been dealing with dramatic infections; it has not required a highly educated scientist to realize the difference when he can observe an epidemic of malaria in one part of the world and then travel to another part and find that malaria is unknown; or to recognize that there is an epidemic of yellow fever in one part of the world and not in another. But when we come to those conditions which are now the most important in Western countries, and which will certainly be the most important in all countries of the world before very long, the position is different. Take, for example, bone tumours. Cancer of the bone has probably been referred to in the newspapers and in our conversations more often in the last few years than any other sort of cancer, because the question has been raised as to whether it may be produced by the fall-out from the test explosions of hydrogen bombs. Now we have no exact knowledge of the incidence of cancer of the bone in any part of the world—not even in this country (and I say not even in this country, because I think that we can pride ourselves that the British mortality statistics are as good as, or better than, those obtained anywhere else in the world). I can, perhaps, give an upper limit: it is, I think, extremely unlikely that the incidence is more than 20 per million persons per year; but whether it is 3 per million or 15 per million I have no idea. And if we are going to try and see whether the incidence of cancer of the bone is increased by 50 per cent. or even 100 per cent., and we do not know our starting line within the limits of 5 to 1, it is quite obvious that we are up against an impossible task.

The same thing applies to many other diseases. Fortunately, greatly improved techniques have been developed recently, and in this respect I would like especially to refer to the work of the Pneumoconiosis Research Unit in South Wales, which has been a pioneer of the technique of morbidity surveys. The unit has developed small teams of sociologists and doctors and statisticians—I do not think they included geographers, but they could have done—which have gone out and selected a population in a well-defined area of perhaps ten or twenty thousand people, and they have then traced all these people, carried out a few simple tests on them and have determined, with a precision which has been undreamed of in the past, the prevalence of half a dozen different diseases in the population.

Teams like this are quite capable, without any very great expenditure of money, of going to a part of the world which does not have accurate census data, or a highly

developed medical service, and determining the prevalence of certain related diseases. (Though not of all diseases, for there are many that cannot be studied in this way.)

In conclusion, I should like to make one other remark arising out of a comment of Professor Banks's—about the necessity of taking into account the possibility that genetic difference may account for differences in prevalence. I may be an eccentric in this respect. I recognize that genetic differences have accounted for some quite major differences in the past—for example, cancer of the exposed part of the skin is common among whites, but the negro is protected by his pigment and he does not get cancer of the exposed parts of the skin. But for every example I could give in which genetic difference has accounted for the major geographical difference, ten could be given in which environmental factors have been the most important. I am sure that Professor Banks did not mean to suggest that the possibility that genetic differences were important should discourage us from undertaking geographical studies, but I very much hope that we will forget about this possibility for the time being and look for environmental factors first and only just keep our weather eye open for genetic differences as being a possible explanation in the background.

Professor DUDLEY STAMP: The great advances in knowledge will be made in the near future in the borderlands between existing disciplines. Professor Banks has made it clear how vital it is that medical men and geographers should get together to study the distribution and incidence of disease. As Professor Banks has said, the mathematician thinks in symbols; the geographer thinks in maps. Therein should lie our first and great contribution. The making of a map must not be regarded as something final but simply as one of a series of experiments. Outline maps ought to be treated as scrap paper. Whatever data may be available, plot them on maps. Try showing them in different maps; the rough maps may just show the inadequacy of the factual material; perhaps one will show some curious pattern, some unexplained anomaly, some irregularity in distribution. It is then that the enquiring scientific mind will say "But why?"—and the investigation is on its way. In the maps which Dr. Learmonth showed there were dark areas, light areas and blank areas. Such a map poses the problems to be investigated.

I would suggest that the subject under discussion tonight can be studied on at least four levels. There is first the world level. Although Professor Banks seems inclined to doubt the value of mapping at world level, the world maps published by the American Geographical Society surely prove otherwise. Why should some diseases be endemic in some parts of the world and not in other parts where environmental conditions appear to be similar? The Director of this work, Dr. Jacques May, has the ideal qualifications—the geographer at heart, the medical man by training, he knows how to handle his material. The maps form at one and the same time an atlas of disease and an atlas of ignorance. By assembling such information as exists, the decks are cleared for action. The second level of study is the national level. Dr. Learmonth, in dealing with the Indo-Pakistan sub-continent, showed strange anomalies in disease distribution and this brings us to the third or regional level.

When I first went to Burma in 1921 my first two years were spent in geological exploration. But why should Rangoon be free of malaria and subject to a mild "Rangoon fever" of its own? Why in the Upper Chindwin district should the strip near the river itself be regarded as healthy when the foothills a few miles away were considered so unhealthy that one's servants deserted—in fear of their lives? So far as I know, thirty-five years later, those contrasts in "healthiness" and "unhealthiness" are still unexplained, just as, nearer home, we really do not know what makes some parts of our country "bracing," other parts "relaxing."

Then the fourth level is the local level—so marvellously illustrated by the Chairman's map of cholera in Soho. Had it been just a map of cholera incidence, think of the questions it would have raised. But the worthy doctor had spotted the connection with water supply, so his map, by marking the stand-pumps, had, at the same time, given the all-important explanation.

I very much hope that, from today's meeting, a British National Committee of those interested in research in this field will be formed. We should not forget that many countries are now interested and many doing good work. On more than one occasion I have been asked why there is not in Britain a centre for research in medical geography. We should remind ourselves that the International Geographical Union has its Commission on Medical Geography set up at the Lisbon Congress in 1949. A First Report was made to the Washington Congress in 1952, a Second to the Rio Congress in 1956. At the latter meeting geographers from the Soviet Union and other Iron Curtain countries were brought in. I suggest that British—and Commonwealth—geographers should therefore go ahead with medical guidance. Put it on a map!

Dr. D. F. ROBERTS (Demonstrator in Physical Anthropology, University of Oxford): I should like to make three points: the first is that no class of geographical factors has been shown to be without influence on the disease pattern. Soil and geology effect conditions like goitre and fluorosis; relief shows itself in the effect of the geographical barriers on the dispersement of diseases. Weather induces fluctuations in morbidity that have reached the headlines during our last few winters in this country. With climate are correlated such afflictions as rodent ulcers in Europeans, and respiratory diseases among Arctic dwellers. Communications clearly affect the spread of an epidemic—in the recent kala-azar epidemics in southern Sudan, if there had been somebody on the spot to map the villages in which and when cases appeared, we should know more about the spread of the disease than we do. The settlement pattern has a profound effect on the effectiveness of epidemics. The effect of isolation of communities, for instance, is shown in outbreaks of "ship's fever" after the annual visit of the supply ship to remote Arctic settlements. Then the economy of any given community sets up its own pattern of disease. We have, among the Caribou Eskimo, a high prevalence of hydatid parasites, in a sylvatic biological cycle, transmission being from the wild canines via the caribou to the human population; the Eskimo living along the sea coast, using seal and polar bear meat, do not suffer to anything like the same extent, but amongst them trichinosis is common.

It is hardly surprising, therefore, to find distinct regional patterns of disease. When one population moves from the region to which it has become adjusted to another, it shows increased susceptibility to the diseases of the region into which it moves.

The second point that I wish to make is that it is difficult to understand the geography of disease unless we consider also the geography of health. Suppose, for instance, we look at the incidence of deaths from sickle-cell anaemia in Tropical Africa. Sickle-cell anaemia occurs in people who possess, instead of the genes for the normal adult haemoglobin (A), two genes for the abnormal haemoglobin S; these unfortunates very rarely reach adulthood. But individuals with one S and one A gene have the advantage of some degree of protection against malaria over those with normal genes only. A great deal of work has already been done and is being done on the distribution of normal characters. For instance, I am thinking specifically of the distribution of the human blood groups. Here in London we have the Nuffield Blood Group Centre at the Royal Anthropological Institute, where for the last six years all data relating to blood group frequencies in different parts of the world have been examined for consistency and for technical accuracy, and they have been mapped. This centre is running out of funds and is reaching the end of its allotted span. If it breaks down it will be a national tragedy. A certain amount of work is being done on the pattern of distribution of human morphology—for instance, the normal body characters found in different human populations, when examined on a world scale, show a marked relationship to the climate of the area inhabited.

This committee that it is proposed to set up would serve an extremely useful purpose; it would keep those of us who are working in the field on our own in touch with each other; it would serve as a clearing house for the exchange of ideas. There is a further matter on which it could advise. How are we going to encourage rising

geographers to take an interest in this particular branch of geographical study? The number of geographical centres in this country where the undergraduates realize that there is such a thing as biological geography can be counted on the fingers of your hand. I would like to make a plea that time should be found in elementary courses for a brief introduction to the meaning of biological geography, or medical geography (call it what you like), so that interest can be stimulated, and so that the work may be carried on in the years ahead.

Professor GILBERT: Before closing the meeting, I would like on your behalf to thank Professor Banks very much for his stimulating paper and also to thank the speakers who have come here specially to contribute to the discussion.

KITIMAT

GEORGE B. BARBOUR

THE GLOBE IS DOTTED with hydro-electric plants which have radically altered the regional economy of the areas in which they lie. The most imposing ones are usually the result of far-sighted planning by state or national governments. Unique in several respects, the Kitimat project is due to the enterprise of the Aluminum[1] Company of Canada, familiarly called ALCAN, whose achievement is less well-known than it deserves to be.

One hundred and thirty miles from the southern tip of Alaska, the headwaters of the Nechaco River rise just over the crest of the Cascade Range of British Columbia. They gather within a dozen miles of a long inlet of the Pacific (see Fig. 1), but, due to the slope of the land surface, drain east in the Fraser River near Prince George, before turning south to reach tide-water at Vancouver, 700 miles from their starting point. By driving a 10-mile tunnel through the range behind Tahtsa Lake in the headwaters, and by throwing the Kenney Dam—the third highest rock-filled dam in the world—across a canyon in the Nechaco valley, engineers ponded the water from a group of fifty snow-fed lakes at an elevation of 2800 feet. This reversed the direction of outflow from a reservoir of 350 sq. miles. Thus the run-off from a drainage area of 5700 sq. miles now moves west through the heart of Mount Dubose (Plate 1) to a penstock system through which it falls 2386 feet to the Kemano power-plant within 200 feet of sea level. The immense head of water thus secured—sixteen times the height of Niagara—develops a maximum of energy from a relatively small amount of water, the loss of which to the Fraser is negligible. Looking at the quiet flow running smoothly out of the tail-race below the power-house it is hard to realize that it has just delivered nearly a million horse-power to the high-tension cables which carry the current 50 miles over the mountains to the Kitimat smelters, where bauxite brought from the Caribbean is converted to the metal.

The stage for the project was set by ice during the later phases of the Pleistocene glaciation acting on the tough crystalline formations of the range. These are the northern extension of the Sierra-Cascade barrier that stretches south almost to the latitude of Los Angeles. The Mesozoic strata of the range had been severely compressed and invaded from below by batholithic offshoots, faulted and cut by intrusives, and buried under a volcanic cover, before being subjected to active denudation throughout Tertiary times. Crustal uplift produced a long, wide platform—an extension of the Yukon and Stikine plateaus—with its surface gently tilted towards the east, so that its coastward margin, rising to summits of over 8000 feet, stood higher than the hinterland. It thus acted as a divide, across saddles in which the fully grown ice-field sent glacial tongues down into the coastal valleys, while the broader sheet spread inland towards the base of the Rockies, and pushed south across the borders of the United States. One lobe blocked the bend of the Columbia River at the Grand Coulee.[2]

The British Columbia ice-field was active in at least two of the stages of glacial expansion and profoundly modified the late Tertiary drainage system. It gouged out the scenic fjord features which today attract tourists along the inland passage to Alaska, and on withdrawal it left a heavy mantle of drift on which the deranged drainage is still at work. During the Ice Age, the volume of water taken out of circulation lowered sea level by some 600 feet. In addition, the weight of the ice cap depressed the land-surface regionally. Subsequent off-loading of the ice led to a slow partial recovery. Thus far the British Columbia coast has regained by emergence

[1] New World influence is responsible for the four-syllable spelling of the element.

[2] See Barbour, G., "Harnessing the Columbia River," *Geogr. J.*, 96, 4 (1940), Figures 1A and B, p. 234.

only 600 feet of the vertical 1600 feet it lost by the previous submergence, whereas farther south on the California coast the recovery seems to be almost complete.

Kitimat itself lies at the head of Douglas Channel (Plate 3), a wide fjord locally deepened to 220 fathoms by a large glacier. From study of topographic maps and observation, both on the ground and from the plane flying in to the airfield at Terrace, one gains the impression that the same glacier was also responsible for the dimensions of the valley now drained from the north by the Cedar and Kitsumkalum Rivers (see Fig. 1). Today water from the latter under-fit stream enters the Skeena at Terrace and flows west with the Canadian National Railway track to the estuary near Prince Rupert. Until 1958, the only land connection with Kitimat was by a spur line south from Terrace over a massive drift barrier that blocks the passage, caught against bedrock obstructions in the bottom of the rock trench. The heavy filling of boulder clay and outwash is not without its economic advantages. The Terrace airfield and railroad settlement make good use of the flat aggraded surfaces. The levelling of a site for the huge housing development for a community of 15,000 at Kitimat was done largely by bulldozers and graders. The drift supports a sturdy forest growth that provides lumber. The remains of a thick lateral delta fan, exposed by emergence, between the town centre and the harbour, has furnished all the sand and gravel needed for construction work at the smelters, the docks and the settlement.

The valley at Kemano where the power is developed 50 miles to the south-east is a minor tributary of Gardner Canal, a fjord which, as Devastation Channel, joins Douglas 20 miles south of Kitimat (see Fig. 1). The 10-mile tunnel from Tahtsa Lake, the Kenney Dam, and the entire conception of the power-plant is a high tribute to the imaginative planning and superb skill of the team of Canadian engineers, who brought them into being in face of staggering difficulties. To meet a tight time-table for the various stages of the project, work began in the spring of 1951, with July 1954 set as the target date for completion. Excavation of the tunnel started in October 1951 from the two ends, and five months later from the mid-point outwards in both directions.

The line followed by the tunnel crosses Mesozoic schists, quartzites and diorites, in a zone where they are intruded by a tongue of the batholithic grandiorite, itself faulted locally and cut by dikes of basalt and more acid intrusives. The line was so laid out that the mid-point of the tunnel comes close to the surface of the mountain-side near the head of a rugged valley that climbs steeply behind Kemano. Here Horetzky Creek Camp was set up at the elevation of 2675 feet to house the drilling crews needed to excavate the tunnel. Two adits were driven side by side more than a quarter of a mile straight into the mountain, and from the far end of these galleries the crews drilled right and left to meet the tunnels approaching from the Tahtsa and Kemano ends, and finally "holed through" on 2 December, 1953, to complete an overall length of 53,060 feet. This underground work went ahead with record speed regardless of the severity of the weather outside. The concrete needed for troublesome sections through the rock was fed in from Horetzky and the adits were then sealed by concrete plugs.

Work had meanwhile been under way on the Kenney Dam at the east end of the reservoir site. At one point in its valley, the Nechaco cut a canyon through a barrier of Tertiary volcanics, somewhat comparable to those in the walls of the Black Canyon of the Colorado River at the Boulder Dam site. In the case of the latter, the depth and narrowness of the canyon called for a high concrete dam to impound the waters of Lake Meade.[1] For the opener valley of the Nechaco, a rock-filled dam with an impervious clay diaphragm was better suited to local conditions. A diversion tunnel was first driven through the north wall of the valley, and coffer-dams were thrown across the channel above and below the site of the dam, to hold out the water while the dam was being built. The floor of the canyon was then cleared and covered with a concrete pad after sealing the bedrock tight by grouting with cement. Much of this foundation work was carried out in mid-winter under canvas covers, so as to have the concrete set

[1] Barbour, G., "Boulder Dam and its geographical setting," *Geogr. J.*, **86**, 6 (1935), p. 500.

in time for the heavy operations after the spring thaw. The dam measures 1500 feet along the crest, is 300 feet high, and has a triangular cross-section. The resistant mass of the structure is of dumped rock-fill taken from a basalt quarry near the left abutment. The up-stream face was lined with a sandwich consisting of a layer of tamped clay between two layers of gravel which separate this membrane below and above from the quarry rock of the core and the final protective rip-rap layer on the up-river face. The critical element is the impervious clay sheet which makes the whole dam water-tight. In plan, the structure curves slightly up-stream, the convexity being deliberately calculated so that pressure from the impounded water only wedges the whole more tightly between the canyon walls as the dam itself settles vertically. When dumping rock-fill at top speed, a chain of 40 trucks delivered a truck load every 45 seconds. The material put into the project would have filled a line of 30-yard dump-trucks stretching bumper to bumper across the width of Canada. The crews liked to realize that the harvest of water finally garnered would fill 359 billion beer glasses!

While the dam was rising and the tunnel being driven, work was going ahead to the same fast schedule on the penstocks from the west end of the tunnel down to the Kemano power-house. The west end of the tunnel is 2595 feet above sea level, only 130 feet lower than the intake at Lake Tahtsa 10 miles to the east. At the Kemano end the water enters two penstock branches roughly parallel with the face of the mountain, inclined at 48° from the vertical. Seen from across the valley (see Plate 1), a scar like a figure "7" on the mountain side marks the site of the operations. The top bar of the "7" is level with the west opening to the tunnel during its excavation. The tail of the figure is the line of the aerial tramway used to hoist men and materials from the loading platform near the power-house portal to the temporary camp at the top. The small cross-bar half way up the stem marks an intermediate station at elev. 1600 where an adit was driven for the drilling of the upper half of the penstock system. Excavation of the lower half was done from the bottom. By setting the penstocks in tubular shafts, instead of as steel pipes down the outside of the mountain, the water supply is protected from landslides, avalanches and air attack, besides needing lighter housing. The steel plating is cemented within the rock and fully supported at all points. From the foot of the two main penstocks, water is directed by valves operated from the control room into one or more of the eight generator turbines according to the changing demand for power. Full power can be turned on or off in any generator within 30 seconds.

The project today has installed eight generators capable of yielding over a million horse-power, but the ultimate plan provides for a total of 2,240,000 horse-power if the demand justifies. This will be obtained by driving a second tunnel parallel with the first from the reservoir to a duplicate system of penstocks and generator chambers still to be blasted out of the rock alongside of the original ones. At present the existing supply is more than sufficient to meet today's requirements.

The power-house itself is built in a cathedral-like vaulted chamber 700 feet long and 180 feet high with an overarching roof blasted out of the rock a quarter of a mile inside the mountain. It occupies the largest man-made cavern in the world and could house the *Queen Elizabeth* (Plate 2b). When I visited it recently with Mr. P. McKernan, superintendent of Kemano Station, the day shift had just gone off duty, and after passing through the security office inside the portal we found a staff of two expecting to ride half a million horse-power through the night from their seats in the control room.

The erection and maintenance of the 306,000-volt power-lines in their exposed position along the 51 miles between the transformers at the Kemano and Kitimat ends, over mountain terrain where temperature falls to − 24° F. with gusty winds reaching 100 m.p.h., and where winter conditions can add a load of two and a half pounds of ice per foot of conductor cable, called for exhaustive preliminary study.[1] Precipitation

[1] Full specifications and descriptions of every phase of the undertaking may be found in the "Alcan Nechaco-Kemano-Kitimat Development," *J. Engng Inst. Can.*, 36, April (1953), 37, November (1954).

is highly variable, but along the ridges exceeds 150 inches annually. The inhabitants speak of a total snowfall of 40 feet as average. Experiments were made during the winter of 1953–4 on the Kildala Pass to be followed by the power-line (see Fig. 1 and Plate 2a), and observations on conventional steel-girder and tubular-aluminium pylons indicated that the smooth outlines of the latter collect less ice, are better suited to the rugged weather, lighter in weight, and safer and easier to erect and maintain. Their parts could be flown in by helicopter and, being hollow, the pylons can be serviced by internal ladders. The result was a simplified design which is likely to be increasingly adopted elsewhere, with the added advantage of resistance to the corrosion which attacks galvanized steel in districts of polluted atmosphere.

Aluminium is the most abundant metallic element in the earth's crust, but until comparatively recently one of the hardest to secure in quantity from its oxide ore, bauxite. It was known that the passage of an electric current through a solution or melt would separate the pure metal from the oxygen to which it clings, but until Hall and Heroult independently discovered that molten cryolite (sodium-aluminium fluoride) would act as a solvent, no progress was made. In 1886 the total world output of aluminium was 18 tons costing £2 a pound. By 1957 production had increased half a million times, and it sells at below 1*s* 6*d* a pound. Today the mineral cryolite is replaced by the cheaper synthetic substitute made from fluorspar, caustic soda and alumina.

The aluminium-oxide is first refined by treating bauxite with hot caustic soda (made from soda ash and limestone under the Bayer process). On cooling, 2 tons of alumina crystallize from $4^{1}/_{2}$ tons of crude ore. The white powdery alumina then comes to the Kitimat smelters.

Six parallel pot-lines, or 1100-foot rows of steel pots with linings and anodes of carbon, are charged with cryolite substitute. Current is turned on and resistance raises the temperature to 400° C, when the cryolite melts. Alumina is then added and the temperature raised to 1000°, when oxygen bubbles off and the molten metal sinks to the bottom. It is poured off into moulds from which ingots are tipped out as they cool, and stacked ready for shipment.

For this heating and electrolytic reduction a plentiful supply of electric current is obviously necessary. The Kemano power-supply is the factor which lowers the cost of production to make competition on the world market profitable, even though the raw material has to come by boat from Jamaica and British Guiana, through the Panama Canal and up the Pacific Coast from Central America.

By the summer of 1954 all was ready and on August 3 H.R.H. the Duke of Edinburgh "tapped" the first 50-pound ingot. The initial stage of production soon rose to 180 million lbs. a year. By 1960 that output should be doubled.

It was my good fortune to visit the locality just as the first stage of development was nearing completion. Thanks to the courtesy of Mr. Harry Jomini, resident engineer, Mr. Gerald Gwyn, works manager, and the geologists to the company, I was enabled to see all aspects of the project and to study some of the geographical factors in the undertaking. I am under a special debt of gratitude to Mrs. Jo McElroy, Council Clerk of the Municipality of Kitimat District, for a clear picture of the background of the development, and for a chance to visit the Indian village of Kitimat Mission across the arm of the fjord.

One aspect of the project deserves attention from the sociological angle. The manpower needed for such an undertaking was a problem in itself. The only truly indigenous population were Indian tribes of the Haisla and Kwakiutl linguistic group, a reserved, intelligent and hardy people, who live with their totem-poles and dug-out canoes in isolated communities on the water's edge during the winter, and send their men-folk to the fishing grounds in summer. At first they were frankly suspicious of the white man's ways and of the modern civilization which undermines their tribal cultures. Though a few have proved highly adaptable and today hold positions of responsibility with the company, their number and training were inadequate to cope

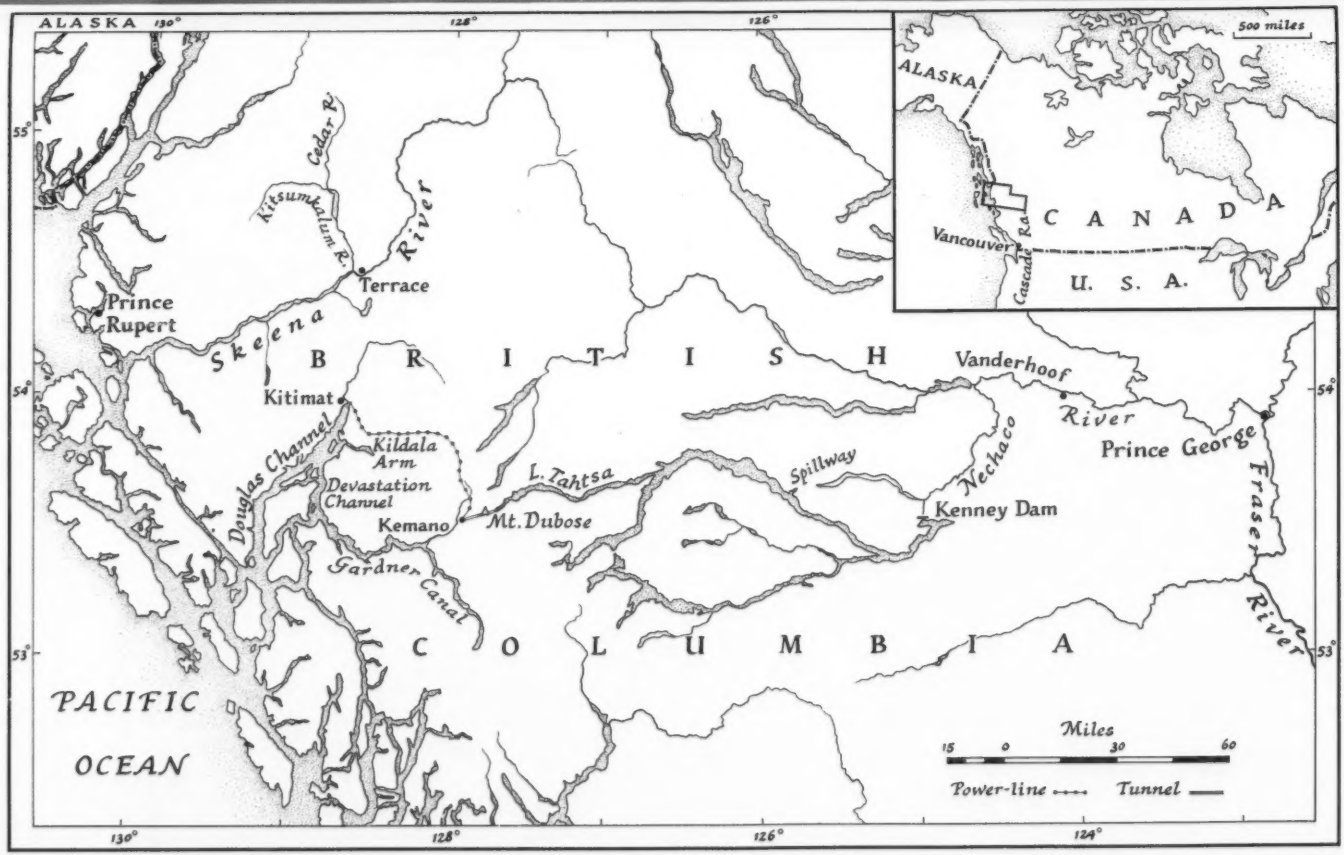
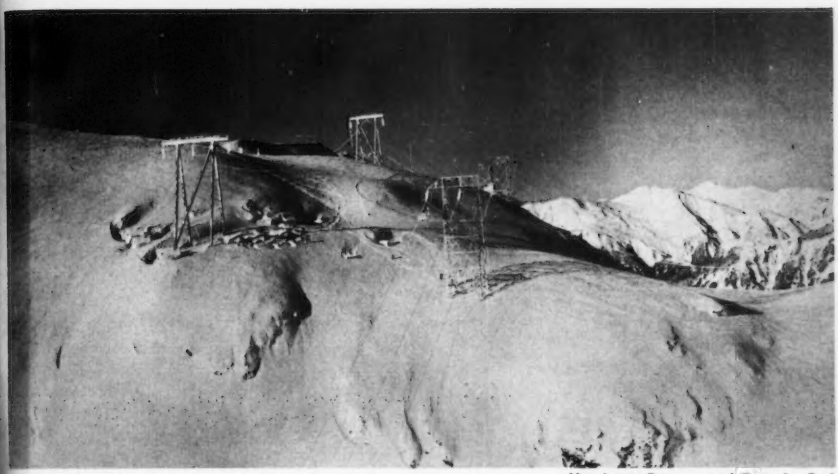

ALASKA
130°
128°
126°
55°
54°
53°
Cedar R.
Kitsumkalum R.
River
Terrace
Prince Rupert
Skeena
B R I T I S H
Kitimat
Douglas Channel
Kildala Arm
Devastation Channel
Kemano
L. Tahtsa
Mt. Dubose
Gardner Canal
Spillway
Nechaco
Kenney Dam
Vanderhoof
River
Prince George
Fraser
River
C O L U M B I A
PACIFIC
OCEAN
Miles
15 0 30 60
Power-line
Tunnel
124°
500 miles
ALASKA
CANADA
Vancouver
Cascade Ra.
U. S. A.

Figure 1

1. Camp 5, Kemano, at base of Mount Dubose

Aluminum Company of Canada, Ltd.



Aluminum Company of Canada, Ltd.

2a. Helicopter view of Camp 11, and two types of tower, on pass between Kemano and Kildala

Aluminum Company of Canada, Ltd.

2b. Excavating walls for Kemano power house

Aluminum Company of Canada, Ltd.

3. Douglas Channel, looking south down Kitimat Arm across new town site to docks and smelter

Aluminum Company of Canada, Ltd.

with an undertaking of this magnitude. Accordingly Alcan embarked early on a campaign to encourage the influx of civil engineering workers from all over the continent and from France, Germany, Portugal, Italy, Greece and the Scandinavian countries. Once settled, they are urged to bring their families and remain permanently. In the first months housing was a problem, and it even paid to tow up the *Delta King*, a discarded river stern-wheeler, and beach it as a bunk house. Wooden shacks and quonset huts sprang up in quantity, and plans were laid out for a permanent settlement where groups of bungalows, bunk houses and apartment units have risen along paved boulevards and streets, around rising ground crowned by residences, and in reach of schools, banks, churches, an imposing shopping centre, library and theatre. At the outset the provincial government declared the area a municipality and assigned a detachment of Canadian Mounted Police. While the development of the settlement was due to company enterprise, it is not a "company town." The community members elect their own representatives, have developed a keen sense of the responsibility imposed by the freedom they enjoy, are encouraged to own their own homes and gardens and to make their own laws in the public welfare.

Too many young communities only discover by sad experience that they made mistakes at the outset which prove costly to undo. The authorities consulted town-planning experts for what must start as a very polyglot community, and used unusual imagination in the blue-print stage.

Six British Columbia towns of over 10,000 population were studied before a master plan for municipal administration was formulated and ratified by the provincial legislature. The district of Kitimat covers 66 sq. miles, half again the size of Victoria, the capital of British Columbia. The Municipal Code adopted in 1953 set up a framework with provision for additions and amendments as they arise. A city manager directs the administration of all public services, including law enforcement, traffic control, fire protection, water-supply, sanitation, snow removal, garbage collection, and the like.

The officials of the company and their wives give active support to all efforts serving the welfare of the community. From health, fire-fighting and public transport, they turned to schools, libraries, sports and other forms of recreation. The telephone directory lists ministers of ten denominations, the Concert Association, Little Symphony and Jazz Society. Besides soccer, hockey, tennis, and curling clubs there are organizations for ski-ing, golf, yachting, fishing and shooting, plus a dozen hobby clubs.

The three schools are located so that one or other is within five minutes walk for any child in the settlement. Coming from 31 countries around the globe, 70 per cent. of the population arrives unable to speak English, and so there are evening language courses for adults. On the train to Kitimat was a Czechoslovakian girl who had expected to be met at Terrace airport by her husband and had not enough Canadian currency to buy her ticket for the last 20 miles of her journey. So we said goodbye to several shillings. But they came back next morning with a note of profuse thanks in German from the little home she had found ready for her. On the boat two days later, a Glasgow girl with a baby of seven weeks was joining her husband who had arrived four months before. After crossing the Atlantic and Canada she was over-awed by the wildness of the fjord, and a little tremulous. Within an hour of arrival, the wife of the resident engineer at Kemano had rounded up a Paisley wife ready to brew a cup of tea and eager for Clydeside gossip.

In its isolated position, the Kemano community saw the need to hold the interest of its men-folk in their leisure hours and through the severe winters. A chapel built in spare time by the entire community, is used in turn by the Anglican, Roman Catholic and United Nonconformist communions, and each encourages attendance by the others. The result is a mutual understanding and respect, out of which have grown a variety of useful projects—an orchestra, a rod and gun club, a library, a social and dance committee, and a theatre where only top-rank movies are shown, changed thrice a week.

Aluminium Company of Canada, Ltd.

Thus in Kitimat's human smelting-pot a United Nations group is being fused, to make its contribution to the New World. By late 1957 the engineering of the first main development had been completed and the population had stabilized at about 12,000—although the hospital records note the advent of an average of 42 new future voters per month! There must be an element of pride in the decision of the Aluminum Company of Canada to restore the *i* in the title of its New York Office, Aluminium Limited.

Since this paper was sent to press, the International Union of Local Authorities at the Hague has published in the issue for Dec. 1958 of the I.U.L.A. *Quarterly* a highly instructive article entitled "The application of the new towns concept: No. 5, Kitimat" by C. M. Henderson, Municipal Manager, which gives in compact, vivid outline the master plan and its implementation. A land use plan shows areas, still virgin forest today, within which black squares mark the positions of future community centres, which will be developed if and as the demand for aluminium grows sufficiently to justify expansion of the industrial plant sites, with consequent need for increased housing.

ANALYSIS OF REGIONAL FLOOD FREQUENCY ON THE NENE AND THE GREAT OUSE

G. H. DURY

ALTHOUGH THE SERIES of gauging records for British rivers are neither numerous nor (with few exceptions) long, some of them appear adequate for use in certain kinds of analysis. In particular, a preliminary study of the hydrometric statistics published in the 'Surface water year-books'[1] indicates that flood-flow frequencies can be obtained for a region which includes large parts of two distinct river-systems. The region comprises 1811 square miles, of which 1180 are drained by the Great Ouse above Brownshill Staunch (grid reference 52/369727) and 631 by the Nene above Orton (grid reference 52/166972). Records from nine gauging-stations have been analysed to give the relationships between catchment area and flood-frequency for floods of recurrence-intervals up to 10 years.

In this context, the term *flood* does not necessarily imply a discharge sufficient to inundate the floor of a valley, but merely means a high discharge. The floods discussed here are annual floods, *i.e.*, the highest discharges in individual water years.[2] The recurrence-interval is the average interval in which a flood of a given size (in units of discharge) will occur as an annual maximum. Thus the 5-year flood—the flood with a recurrence-interval of 5 years—can be expected to occur as the annual maximum once in a given 5-year period.

Since not all the gauging-stations supply continuous records (Table I), it has been necessary to use records of maximum daily discharges; *i.e.*, records of the highest mean daily discharges recorded in single years. Momentary peak discharges would be more to the purpose, but it will be shown that a simple relationship connects maximum daily and momentary peak discharges on the Nene, where a correcting factor can be employed.

The techniques of analysis described in what follows are familiar to hydrologists and are standard practice in the U.S. Geological Survey.[3] They include (1) the adjustment of available records to a base-period by interpolation of missing figures, (2) computation of recurrence-intervals for floods of given magnitudes at each station, (3) testing for homogeneity of records, and (4) graphing of the relationship of catchment area to floods of selected recurrence-interval for the region as a whole.

1. *Adjustment of records to a base-period.*—When some of the series of available records are short or broken (Table I), missing figures can be interpolated. Interpolated values have no reality, but interpolation is useful in making the actual records easy to handle, and is especially convenient when short series include both very high and very low annual floods. As will be shown, adjusted and unadjusted series give almost identical results, so that (in this instance at least) the increased convenience obtained by interpolation is not gained at the expense of accuracy.

Interpolation is effected in the following manner: one station, normally a station with an unbroken record for the base-period, is selected as a station of reference; the highest annual discharges recorded at other stations are plotted, year for year, against the corresponding discharges at the station of reference; on each graph a line is drawn

[1] 'The surface water year-book of Great Britain.' H.M.S.O. Published at irregular intervals.

[2] A water year extends from October to the following September, inclusive.

[3] See, for example, T. Dalrymple: 'Highway research board report: 11–B, Surface drainage.' Washington, D.C., 1950. The present writer is greatly indebted to Luna B. Leopold of the U.S. Geological Survey for drawing his attention to this and other useful material, and also for much helpful advice and discussion.

through the origin and through the point plotted for the means of the two sets of values, and this line is used to supply the missing figures. For the present purpose, the base-period is taken as the water years 1937/38 to 1953/54, inclusive, and the station on the Great Ouse at Bedford is used as that station of reference (Fig. 1). There seems no need to use calculation instead of graphs, for the scatter of plotted points can be expected to show whether or not interpolation is justified. In any event, the records are subjected to an independent test for homogeneity.

2. *Computation of recurrence-intervals.*—When the series of records have thus been adjusted to the base-period, a list of recorded and interpolated annual floods is compiled for each station. The values are ranked in order, 1, 2, 3, . . . *n*, starting with

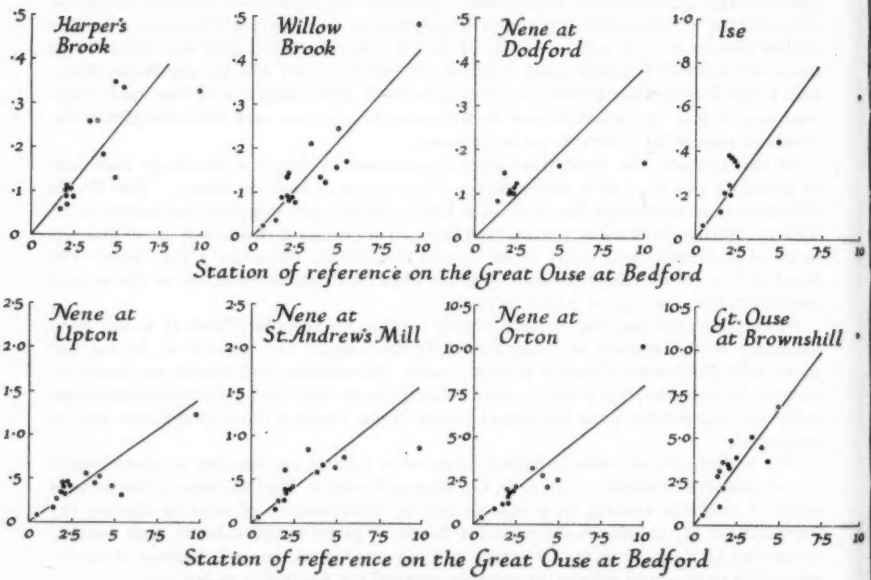

Harper's Brook
Willow Brook
Nene at Dodford
Ise
Station of reference on the Great Ouse at Bedford
Nene at Upton
Nene at St. Andrew's Mill
Nene at Orton
Gt. Ouse at Brownshill
Station of reference on the Great Ouse at Bedford
Horizontal and vertical scales in thousands of cu. ft./sec.

Figure 1

the highest, *n* being the number of years in the base-period. The frequency in years of the listed discharges is then given by

$$\text{R.I.} = \frac{(n+1)}{\text{R}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where R.I. is the recurrence-interval and R the ranking order of the discharge. The discharges are then plotted against their recurrence-intervals on probability-paper,[1] and a smooth curve drawn through the plotted points (Fig. 2).

A curve so drawn has little significance at its upper end, especially when it is derived from a short series of records; in Fig. 2, for instance, the discharge of 11,300 cu. ft/sec. on the Nene at Orton falls outside the limits of the diagram. So far from being extrapolated, a curve should be used in reading-off floods with a recurrence-interval

[1] Dalrymple, T. *op. cit.*; E. J. Gumbel, *Engineering News-Record*, 14 June 1945; R. W. Powell, *Civil Engineering*, **105** (1943).

not greater than about half the greatest value plotted. If recurrence-intervals up to twenty years are indicated, it is unlikely that the curve will be accurate for intervals greater than about ten years.

3. *Testing for homogeneity.*—A simple graphical test of homogeneity can now be made. From the curves of discharge/recurrence-interval drawn in the manner just described, the 2·33-year flood and the 10-year flood are read for each station. The latter value is divided by the former, giving the 10-year ratio for each station. The mean of these ratios is found, and each 2·33-year flood multiplied by it. The resulting values are then plotted against the length of actual record on a graph, which is designed to reveal departures greater than those attributable to chance.[1] If the plotted points fall outside the heavy curved lines on the graph (Fig. 3), the records to which they refer fail to pass the test of homogeneity, but if they fall within, the records can be accepted.

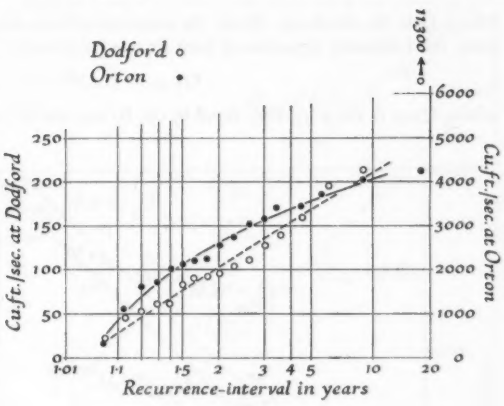


Figure 2

In Fig. 3, the test for homogeneity is applied both to adjusted and to unadjusted series of records. All members of both kinds of series are acceptable. As would be expected, there is little difference between the 2·33-year flood indicated by the adjusted records, and that for the same station and recurrence-interval derived from adjusted figures; short unadjusted series, however, can give but a rough indication of the value of the 10-year flood.

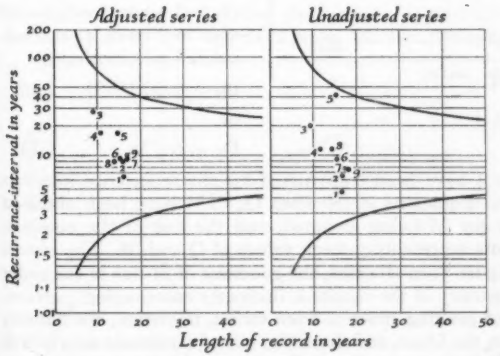


Figure 3

4. *Relationship of flood-discharge to catchment area.*—The processes of calculation and graphing which have been described so far are intended to ensure that the various series of records are comparable with one another, that they are convenient to handle, and that some of the inevitable irregularities are smoothed out. The next process is designed to determine the relationship, if any systematic relationship exists, between discharge of given recurrence-interval on the one hand, and area of catchment on the other.

When values for the 2·33-year flood at the several stations are plotted on logarithmic

[1] The principles of the design of this graph are more fully summarized in T. Dalrymple, *op. cit.*, where statistical authorities are quoted.

paper against catchment areas, the points arrange themselves in a pattern which suggests an exponential relationship of a simple kind between the two sets of values (Fig. 4). On the assumption that discharge is related to catchment area in the form

$$Q = aM^b \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2a)$$

where Q is the discharge (here, the maximum daily discharge), and M the catchment area, the following equation of best fit was calculated:

$$Q_{2\cdot33} = 5\cdot1\ M^{0\cdot9759} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2b)$$

where $Q_{2\cdot33}$ is the 2·33-year flood in cu. ft/sec, and M is the catchment area in square miles. There is very little difference between the values obtained from this equation and those given by

$$Q_{2\cdot33} = 4\cdot4\ M \quad . \quad (2c)$$

and this second form is here accepted.

Equations (2b, 2c) are derived from adjusted series of records. Almost identical results are obtained from unadjusted series, namely

$$Q_{2\cdot33} = 5\cdot0\ M^{0\cdot9747} \quad (2d)$$

or

$$Q_{2\cdot33} = 4\cdot4\ M \quad . \quad (2e)$$

The 5-year floods read from graphs for adjusted series of records are also plotted against catchment area in Figure 4; the calculated relationship is

$$Q_5 = 7\cdot6\ M^{0\cdot9688} \quad (3a)$$

or

$$Q_5 = 6\cdot4\ M \quad . \quad . \quad (3b)$$

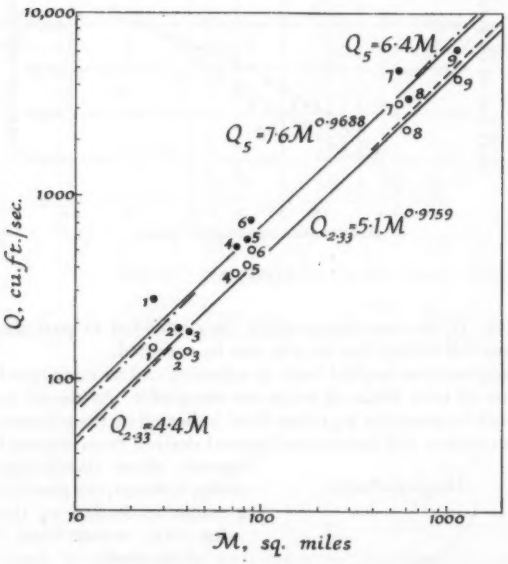


Figure 4

Diagrams similar to Figure 4 have been constructed for the recurrence-intervals of 1·2, 1·5, 3, 8, and 10 years. Equations in the form $Q_n = aM$ have been obtained graphically, an integral value for M being assumed, and the line of the equation being passed through the points representing mean values of Q and M. The results obtained are exemplified in Figure 5; in all cases, the goodness of fit was of the order shown in Figure 4. The consistency of the results is distinctly encouraging, particularly in view of the variation of gauging practice from station to station, the liability to inundation of the stations on the Ouse, and the difference of catchment area which separates the stations into two groups, one with small and one with large catchments. Furthermore, no allowance has been made for abstraction or release of water, *e.g.* by reservoirs (*cf.* Table I). In the published figures, allowances for abstraction or release are made on a monthly basis, and are not very helpful in the present context. The fact that uncorrected data are susceptible to analysis and give consistent results suggests that the discharges under discussion are little influenced by artificial diversions of flow, but matters might well be otherwise with low flows.

When discharges in cu. ft/sec/square mile are plotted against recurrence-interval,

a graph is obtained which suggests a fairly simple mathematical relationship. A plot on probability-paper of the kind used in Fig. 2 gives a straight line for recurrence-intervals of 1·2 to 5·0 years inclusive,[1] while a not wholly satisfactory equation has been empirically derived[1] for use with a plot on plain-scale paper. On the other hand, an excellent fit is obtained by an equation in the form

$$y = \sqrt{\frac{x}{a}} \quad . \quad (4a)$$

where y is the discharge in cu. ft/sec/square mile, x is the log (to base 10) of the recurrence-interval, and a is a constant. In this instance, the equation can be written

$$Q = \sqrt{\frac{\log \text{R.I.}}{0{\cdot}0177}} \quad . \quad (4b)$$

where Q is the discharge in cu. ft/sec/square mile corresponding to the recurrence-interval R.I. (Fig. 6).

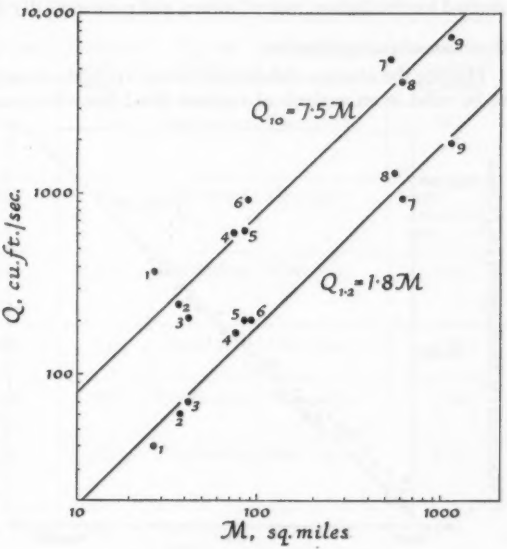


Figure 5

Regional floods and floods at-a-station

It is possible that a systematic relationship connects discharges at a single station and the discharges predicted by the graph for regional floods—*i.e.*, that discharges at-a-station run consistently above or consistently below the regional figures for the particular area of catchment. At the simplest, such a relationship might take the form

$$Q_s = cQ_r \quad . \quad . \quad (5a)$$

or $Q_s = Q_r \pm c$. (5b)

or $Q_s = Q_r(1 \pm c)$ (5c)

where Q_s is the discharge at-a-station of given recurrence-interval, Q_r is the regional flood for the same recurrence-interval and catchment area, and c is a constant. Longer records and more analysis, however, are needed if this suggestion is to be tested.

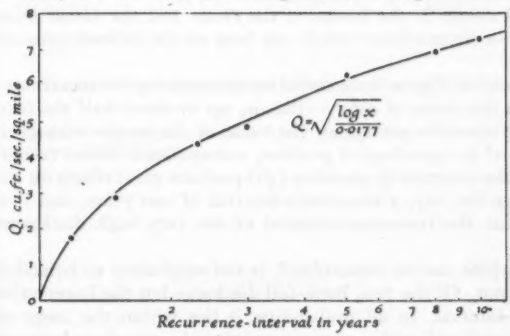


Figure 6

Relation of maximum daily to momentary peak discharge

Records of momentary peak discharges are not available from stations without continuously-recording gauges (Table I). When momentary peak and maximum

[1] Dury, G. H., *Trans. Inst. Brit. Geogr.*, 1958, Fig. 9 and Note 14.

daily discharges for stations on the Nene are plotted against one another (Fig. 7), the scatter of points suggests that momentary peak discharge is 17 per cent. higher than maximum daily discharge, except at low flows where irregularities are inevitably to be expected. The line drawn in Figure 7 for $y=1{\cdot}17x$ passes exactly through the point plotted for the highest pair of values, and runs medially through the scatter as a whole.

Conclusions and applications

Despite the obvious deficiencies of the available records, the data treated here seem to be valid in an analysis of regional flood-flows for recurrence-intervals of at least 5 years, and probably for intervals up to 10 years. The 2·33-year flood, identified by Dalrymple with the mean annual flood, can be accurately assessed. Throughout the range of discharges examined, each square mile of catchment contributes an identical amount of water to a flood of given recurrence-interval. This statement does not imply that a given stage is ever reached simultaneously throughout a whole river-basin. Furthermore, work in progress[1] indicates that the discharge/area relationship is modified in catchments less than some 5 square miles in area. The discharge/area relationship here claimed for catchments larger than this accords precisely with the results of numerous hydrological studies elsewhere; in its geographical application, it indicates that the system of overland slopes in the basins of the Nene and the Great Ouse is most delicately organized—a circumstance which may bear on the difficult question of flow down graded slopes.

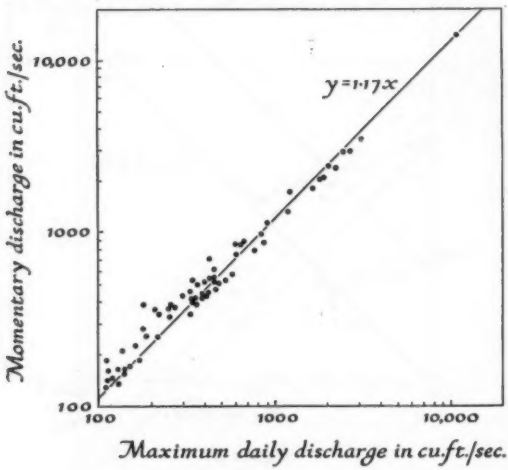


Figure 7

Graphs of the kind illustrated in Figure 6 are useful for determining the recurrence-interval of discharges within the limits of safety—that is, up to about half the total length of the record—rather than for predicting the value of discharges with great recurrence-intervals. As usual in hydrological practice, extrapolation is not recommended; small variations in the constant in equation (4b) produce great effects on the predicted values of discharge for, say, a recurrence-interval of 100 years, and it is not yet possible to determine the recurrence-interval of the very high discharges recorded early in 1947.

Mean annual discharge, which can be determined, is not equivalent to bank-full discharge, which as yet can not. Of the two, bank-full discharge has the lower value and the shorter recurrence-interval. In all probability, it lies within the range of discharges which have been analysed, with a recurrence-interval somewhere between 1 and 2 years. The bank-full stage is extremely significant in the study of present stream-channels and existing profiles, and its determination, as soon as records permit, is a matter of urgency. If discharge at bank-full can be established, light can be expected to fall not only on present rivers and present regimes but also on the rivers

[1] Expected to be described in the *Geographical Review*.

and regimes of former times, for, as has been shown,[1] the problem of misfit streams is essentially one of the reduction of bank-full discharge.

TABLE I

*Gauging-station**	*Grid ref.*	*Basin*	*Drainage area (sq. miles)*	*Type of record*	*Records from*	*Area drained to reservoirs (sq. miles)*
1. Harper's Brook, Old Mill Bridge	42/983799	Nene	26·9	Continuous	Dec. 1938	Nil
2. Willow Brook, Fotheringhay	52/067933	Nene	36·4	Continuous	Oct. 1938	Some industrial use
3. Head of Nene, Dodford	42/625612	Nene	41·3	Continuous	Mar. 1945	3·34
4. Ise, Harrowden	42/898715	Nene	74·9	Continuous	Dec. 1943	4·93
5. Head of Nene, Upton	42/721592	Nene	86·1	Continuous	Nov. 1939	3·34
6. Head of Nene, Brampton	42/747617	Nene	89·9	Continuous	Mar. 1939	8·39
7. Bedford	52/055495	Gt. Ouse	565	Staff, once daily	Oct. 1936	Nil
8. Orton	52/166972	Nene	631	Continuous	June 1940	19·4, plus some industrial use
9. Brownshill Staunch	52/369727	Gt. Ouse	1180	Staff, twice daily	Oct. 1936 (1939/40 incomplete)	Nil

* *The numbers in the first column are used to identify stations in Figures* 3, 4, *and* 5.

[1] Dury, G. H., *op. cit.*, *Nature*, **172** (1953), p. 919; *ibid.*, **176** (1955), p. 31; *American Journal of Science*, **252** (1954).

VARIATIONS OF THE ICE MARGINS IN EAST ANTARCTICA

MALCOLM MELLOR

SINCE THE LAST CENTURY, glaciers over most of the earth have been shrinking. A mass of evidence of this trend has been collected by Ahlmann in a comprehensive survey of glacier variations,[1] while other writers, too numerous to mention, have brought forward proof of recent glacier recessions in Europe, North and South America, Africa, Asia, New Zealand, and the Arctic regions. Since about 1940–50, however, there are signs that the recession has become less general in the Northern Hemisphere and there is some evidence that the temperature rise in the Arctic culminated about 1940.[2]

Glacial recession has been widespread throughout the Arctic and Sub-arctic, and numerous examples have been reported from Alaska, Canada, Iceland, Jan Mayen, Spitsbergen, Franz Josef Land, Novaya Zemlya, Norway, and the outflow glaciers of the Greenland ice cap. It would seem reasonable, then, to consider the possibility of some corresponding process in Antarctica and, indeed, some reports[3] give the impression that ice recession was occurring in west Antarctica in 1940. Further reports of recent glacier retreat at Heard Island have been made by several members of the A.N.A.R.E. (Australian National Antarctic Research Expeditions). Against this, however, Schytt[4] was able to state that no appreciable thinning of the ice had occurred in Dronning Maud Land for many years prior to 1950. In these circumstances the writer, while working at Mawson with the A.N.A.R.E. during the International Geophysical Year, approached the question of ice margin variations in east Antarctica with an open mind. The studies in this field were divided into two broad categories: an attempt to show whether or not there had been fluctuations of the ice margins during the past century or so, and a search for evidence of changes on a larger time scale, *i.e.* post-Pleistocene variations. These will be considered in turn.

Recent Fluctuations

Coastal ice cliffs.—In the summer of 1936–7 the coast of Mac-Robertson Land was mapped in detail by the Lars Christensen Expedition.[5] The charts resulting from this aerial survey are believed to show the position of the ice front accurately, since the numerous islands, skerries, and rock outcrops dotted along the coast greatly facilitate photo-control. In 1957 special flights were made for glaciological purposes, and the snouts of three glaciers were surveyed twice during the year, using the vertical camera of a trimetrogon battery. These surveys were intended to serve two purposes: to check the positions of the ice fronts against their 1936 positions, and to obtain a measure of the rate of flow of the glaciers. It was immediately apparent from the aircraft that no drastic changes had taken place between 1936 and 1957, and this impression was confirmed when the photographs were examined. Prints of the 1936 oblique photographs were made available by the Norsk Polarinstitutt and these were compared with similar aerial oblique photographs taken in 1956. The detailed results follow.

The Dovers Glacier calves into Stefansson Bay and does not exhibit the projecting tongue which generally characterizes fast-moving ice streams along this coast. The many rock exposures at the place where the glacier debouches make it easy to plot the ice front. In December 1957 the ice cliffs were $3\frac{1}{2}$ kilometres in advance of their 1936 positions. The breakaway of a large part of the glacier end is imminent, and if this occurs in 1958 the ice front will once more be in the 1936 position.

The tongue of the Hoseason Glacier projects almost 10 kilometres seaward but is

stabilized by rock exposures on each flank. In August 1957 the glacier terminated about 1½ kilometres further back than the 1936 position.

The tongue of the Jelbart Glacier is in the form of two prongs, and rock projects above the surface of the sea in the bay between them. In 1954 it was observed from the air that much of the west prong shown on the 1936 map had broken off and disappeared. A small part of the east prong calved in 1956 and in 1957 the end of this prong was 1 kilometre short of its 1936 extent. In 1957 the west prong was 4 kilometres behind the 1936 position and flow measurements indicate that it will take about forty years to regain that former position.

Photographs show that the Taylor Glacier was in a more advanced position in 1956 than in 1936, the difference being only a few hundred metres. The 1936 photographs show that the glacier was about to calve, a split having occurred along the hinge line. Both the 1936 and the 1956 photographs show the hinge line and a longitudinal trough in the same general positions.

Occasional small rocks emerge from the ice cliffs along the coast and some of these can be scrutinized on both 1936 and 1956 photographs. In all the cases examined there were no noticeable changes, so that any fluctuations in the position of the ice front at these points could not have exceeded 100 metres.

Perhaps the most interesting photographs are the ones showing the Fold Island ice cap. This is a small domed ice cap (25 km.^{2} in area) which has formed over a group of small islands lying 7 kilometres off shore of the continental ice sheet. It receives a snow accumulation, suffers ablation, and loses ice by calving, so that it might be considered to be a rather sensitive miniature ice cap. The spacing of the easily recognizable annual bands suggests that the residence time for a snow particle in this ice cap would be of the order of only 50 years. Study of the photographs failed to reveal any change in the areal extent or thickness of the ice during the past twenty years (see Plate 1).

Before leaving the subject of photographic evidence, it might be well to discourage the immediate consideration of climatic implications in the reported advance of the Sandefjord Bay glacier tongues.[6] The fantastic confusion of icebergs, broken glacier tongues and bay ice in this corner of Prydz Bay apparently persists for many years, but it is quite possible that exceptional gales could clear the ice back to the 1936 position. If this did not occur an eastward extension of the Amery Ice Shelf might result.

It appears, therefore, that there have been no significant changes in the positions of these glacier tongues between 1936 and 1958. The calving period varies from glacier to glacier, and for medium-sized glaciers the cycle of extension to instability, followed by calving, is of at least several years' duration.

It might be added that many of the smaller inland valley glaciers of the Mawson Escarpment, Princess Elizabeth Land, and of the Scott Mountains in Enderby Land exhibit elevated lateral moraines which have their crests some 50 metres above the level of the present glacier surface. Numerous cases were examined from the air, but no ground observations proved possible, so that the significance of these features remains a subject for speculation. Péwé[7] suggests that similar moraines in the McMurdo Sound region may represent minute glacial advances of the last few centuries.

Finally, a somewhat different set of data might be mentioned. In February 1955 a series of cairns was laid down along the ice-rock contact at Mawson. When the cairns were checked in January, 1956, the ice had receded, the average distance being 2·34 metres and the maximum, 6·70 metres.[8] In February 1958 the cairns were again checked, and this time the average distance from cairns to ice was 1·83 metres with a maximum of 7·30 metres. The plateau ice merges smoothly into the rock and moraine at Mawson, so that the ice along the surface contact is a thin wedge only. This thin ice is likely to be sensitive to normal year-to-year variations of ablation, and hence these measurements suggest no significant changes.

Botanical evidence.—On Mount Henderson, 15 kilometres inland from Mawson, the

lichen *Gasparrinia harrisoni* was found growing within two metres of the ice-rock contact, which is at an altitude of about 500 metres above sea level. The rate of local migration of this species is not known, but it might be expected to be slow. Some patches of lichen were growing close to the ice on bare granitic gneiss in positions which receive little direct sunlight even in summer, and the rock is very dry for eight months of the year. Beschel,[9] in his writings on the dating of lichens, shows that lichen growth is influenced directly by the amount of available light and water; this being so, conditions on Mount Henderson cannot be particularly favourable to lichen migration. Similar evidence of lichens growing close to the ice-rock contact led Schytt[3] and others to the conclusion that no glacial retreat is taking place in Dronning Maud Land at the present time. If a method of dating these Antarctic rock lichens should be developed fresh samples could easily be collected from Mount Henderson as long as Mawson station is occupied.

Ice recession on Heard Island.—The foregoing has shown that there is no definite evidence for a recession of the ice margins of the Antarctic continent at the present time. When we go further north, however, the picture becomes very different.

Heard Island is situated in lat. 53° 05′ S. long. 73° 30′ E., about 1750 kilometres north of Mac-Robertson Land and approximately 150 kilometres south of the Antarctic convergence. The island is roughly circular in plan and about 25 kilometres across. It is dominated by the 2750 metre Mawson Peak, which is an active volcano, and glaciers flow down the mountain flanks to the precipitous coast. The firn limit is at 300 metres above sea level, and the island is cloud-covered for most of the year. Four scientific expeditions called at the island between 1873 and 1930, and in December 1947 a scientific station was established there by the A.N.A.R.E.[10] This station was manned until 1955, and since that time A.N.A.R.E. relief ships returning from Antartica have called every autumn.

Evidence for glacial retreat at Heard Island was advanced by Lambeth[11] in 1951, but no dating of the ice recession resulted from his work. It is the opinion of casual observers that the glaciers have receded further during the period 1947–58, but the photographic evidence is inconclusive. Likewise, photographs taken in 1902[12] and 1929[13] do not afford a good means of comparison.

There is one item of evidence, however, which can be regarded as a reliable indicator of recent thinning of the ice (*i.e.* during the past 100 years or so). On the west bank of the Baudissin Glacier a lateral moraine forms a terrace along the slopes of Mount Drygalski, which is itself covered in old morainal material. Mosses and azorella grow on Mount Drygalski, but the moraine below the terrace is bare of vegetation. Thus there is a clearly defined trim-line very similar in appearance to the ones seen in Iceland. The elevation of the trim-line above the present glacier surface was estimated at 30 metres. The wind directions at Heard Island and over the surrounding ocean have changed during the past century. A hundred years ago there were far fewer south-westerly winds and far more northerly winds than there are at the present time.[14] It is not really surprising to find that climatic ameloriation has produced a decrease in the volume of ice on Heard Island without bringing about any noticeable changes in Antarctica. At Heard Island convection and rainfall are more important agents of ablation than radiation, and a rise in the mean temperature will intensify their effectiveness. In Antarctica, however, calving is of greater importance than ablation, which in any case is brought about chiefly by radiation. A minor rise in the mean temperature would not be likely to influence the rate of calving or ablation there to any great extent, and the reaction of the continental ice sheet to climatic fluctuations must be expected to be slow.

Major volume changes of the Antarctic ice

When flying over the mountains of Enderby Land, Kemp Land, Mac-Robertson Land, and Princess Elizabeth Land, it is immediately apparent that the ice sheet was once of a much greater thickness. In the Prince Charles Mountains and in the

Gorge connecting Radok Lake and Beaver Lake

ANARE photograph by M. Mellor

The Fold Island ice cap

Scott and Tula Mountains, high mountains have moraine-covered flanks, and smaller mountains may be completely moraine-covered. In these same mountains deserted cwms and glacial valleys may be seen, while along the coast there are numerous islands exhibiting dry valleys, erratics, and *roches moutonnées* profiles. The height of the moraine deposits on the higher mountains suggests that the ice sheet formerly had a thickness at least 600 metres greater than its present one, at a distance of 100 to 200 kilometres from the present coastline. During a survey of a mountain range 650 kilometres south of Mawson the author found the lower hills and nunataks to be completely moraine-covered, and estimated the height of the moraine on the main peak, Mount Menzies, as 450 metres above the present ice level. The elevation of the surface of the ice sheet in this region is 1900 metres above sea level. In the Framnes Mountains, close to Mawson, erratics have been observed 180 metres above the ice level, and dry glacial valleys can be seen up to 120 metres above the present ice surface.

The coast of east Antarctica is fringed by numerous submarine banks upon which large numbers of icebergs become grounded. These banks, which lie 80 to 150 kilometres north of the present coastline have been described as old moraines which indicate a former extent of the ice sheet.[15] Conflicting theories are held about the origin of these banks, but it is by no means unlikely that they are, in fact, ancient terminal moraines.

There is ample evidence that the ice sheet has suffered a drastic reduction in size from some former maximum, and moraine observations indicate more recent small-scale fluctuations in the ice volume. Without the aid of radio-isotope dating methods it is rather difficult to decide on time scales, but some estimates of the order of magnitude of the periods involved can be made by extrapolation of current mass economy data. By assuming a virtual cessation of snow accumulation on the continent and applying suitable rates of ice outflow, ablation, snow transport and oceanic melting it has been estimated that a minimum time of several thousand years would have been required to achieve the necessary draw-down and retreat of the ice from the last glacial maximum.

In the Prince Charles Mountains evidence was found suggesting that the major ice recession terminated some considerable time ago. Two large meltwater lakes, Radok Lake and Beaver Lake, are connected by a winding, water-cut gorge. The lakes lie in rock bowls at the foot of a massif and are 500 to 600 metres below the highest level of the moraines. The gorge is about 6 kilometres long, 60 metres deep with side-slopes of approximately 45°, and has a total fall of perhaps 60 metres. The rock is a soft sandstone and water flows out of Radok Lake for only a few weeks each year. The pattern of refrozen meltwater on the surface of Beaver Lake suggests that the discharge from the channel is not excessive. It is not easy to estimate the length of time necessary to cut such a channel. Erosion rates for established watercourses are of little use, but it is known that water leaving lakes carries little sediment and is only mildly erosive.[16] Without stream gaugings calculations cannot be attempted, but the evidence was assessed in the light of some previous engineering experience in river works and erosion control and it was decided that at least several hundred years had elapsed between initiation of the erosion and completion of the present stable profile. It can be confidently stated, therefore, that the ice of the Lambert Glacier region has not been much above its present level during the past few hundred years (Pl. 2).

From the foregoing, it seems that the major ice recession in Mac-Robertson Land and Princess Elizabeth Land is not likely to have been initiated less than 10,000 years ago, and it must have been completed at least several hundred years ago.

Conclusions

At some former glacial maximum the Antarctic ice in the sector between 45° E. and 80° E. was thicker by at least 600 metres at a distance of 400 km. from the present coast, and by 450 metres at a distance inland of 700 km.

The evidence suggests that the major glacial recession was initiated not less than

10,000 years ago, but the observations, which were incidental to other investigations, give little information on smaller scale fluctuations. The work of the Russian expedition in the Bunger Hills leads Shumskiy[17] to the conclusion that the Antarctic "oases" have been clear of ice for 10,000 years. These estimates seem to indicate that the glacial decline from the Pleistocene maximum and the onset of the Climatic Optimum in Antarctica occurred contemporaneously with these events in other parts of the world.

The studies of recent ice fluctuations show that, in Mac-Robertson Land and Kemp Land, the ice has suffered neither thinning nor retreat to any detectable extent during the past twenty-one years. The botanical evidence suggests that the volume of ice may have been constant for a longer period. Photographic evidence from McMurdo Sound[7] shows that only negligible changes have occurred in that region in forty-six years.

One theory holds that climatic amelioration could lead to increased precipitation in Antarctica, with a resultant expansion of the ice sheet. Loewe[18] has suggested that the level of the inland ice may be rising, but considers that centuries may elapse before the effects appear in the fringe regions. No such expanding tendency has been exhibited by the Fold Island ice cap during the past twenty years, although it should respond readily to changes of alimentation. On the other hand, a recent analysis of mass economy data by the writer (not yet published) showed a surplus of accumulation over ice loss, thus supporting Loewe's suggestion. However, the mass balance of the ice sheet cannot be properly determined until the I.G.Y. results have been coordinated. There is some evidence that recent changes in atmospheric circulation have affected conditions over the Southern Ocean, but so far no observable changes in the volume of Antarctic ice have been produced.

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FROM THE *JOURNAL* A HUNDRED YEARS AGO

THE FOLLOWING EXTRACT is taken from "The lake regions of Central Equatorial Africa," by Captain Richard F. Burton, published in full as the *Journal of the Royal Geographical Society*, Vol. 29, 1859. (See pp. 24–5.)

"Geographers can now describe with accuracy the general features of the African peninsula. The northern and southern belts of the vast irregular triangle, save in the exceptional places where perennial streams diffuse fertility, and along the coast where excessive humidity engenders a narrow growth, are dry and sterile, here laid out in torrid plains, there broken into barren stony ridges. Bisected by the zone of almost constant rain, and subject to the south-west monsoons, the local deflections of the south-east trade winds,—from the Chad Lake, the Bahr el Ghazal, and the southern frontier of Kordofan, the region of fertility, commencing from about 15° N. lat., stretches in a broad belt to 20° S. of the equator, or, the northern limit of the Ngami Water. This tract of 35° along the major axis of the continent rejects the old hypothesis of desert and plateau, and forms the sharpest contrast to our grandfathers' idea of Central Africa.

The eastern section of the central belt south of the equator which will be described with detail in these pages, is a region in which Nature displays her wonted variety. Near the coast are low littoral plains and rolling ground, with lagoons, savannahs, and grassy valleys, the courses of large streams, whose banks, inundated by rain-floods, retain in the dry season meers, morasses, reedy marshes, and swamps of black infected mud. Beyond the maritime regions rise lines and mountain groups of primary and sandstone formation, ridges and highlands often uncultivated, but rarely sterile, with basins and hill-plains of exuberant fertility, traversed by perennial runnels and streams. Beyond the landward slope of these African Ghauts begins an elevated plateau, now level and tabular, then broken into undulations and gentle eminences, displaying by huge outcrops of granites and syenites the activity of the igneous period, where rain is deficient, thinly clad with bush, broom, and shrubbery, with thorny and succulent thickets, cut by furrows and burnt by torrid suns, and veiled where moisture abounds with tangled jungle rising from shallow valleys, with umbrageous forests broken into glades of exceeding beauty, and with interjacent plains of emerald or amber-coloured grass, from which trees of the darkest laurel green, and knolls and clumps, large and small, against which no feller has come up, cast thick shade over their subject circlets of luxuriant underwood. Dull, dreary, and monotonous, where lying desert, in parts this plateau is adorned with a lavish Nature's choicest charms and varieties. Beyond it, again, the land sinks into the Lake Region, or the great Central Depression; the superabundant moisture diffused by its network of waters, fordable and unfordable, covers the land with a rank growth of gigantic grasses and timber trees, and the excessive luxuriance of nature proves unfavourable to the development of animal organisms. Throughout the line, to judge without statistics, in the more sterile parts, about one-fifth, and in the more fruitful one-half of the land, is under cultivation; whilst almost everywhere the abundance of the desert vegetation evidences of the marvellous capabilities of the almost virgin soils."

A MEDIEVAL MAP OF BRITAIN

THE MAP OF GREAT BRITAIN, CIRCA A.D. 1360, KNOWN AS THE GOUGH MAP. An introduction to the facsimile, by E. J. S. Parsons. With: 'The roads of the Gough Map,' by Sir Frank Stenton. (Royal Geographical Society: Reproductions of early manuscript maps, IV. Bodleian Library: Map reproductions, I.) *Oxford: University Press*, 1958. *Collotype facsimile*, 2 *sh.*, $23^1/_2 \times 25^1/_2$ *inches. Overlays*, 4 *sh.*, $23^1/_2 \times 25^1/_2$ *inches. Text*, $12^1/_4 \times 10$ *inches;* 38 *pages.* 50*s*, *plus postage, from the Library or the Society.*

THE FOURTEENTH CENTURY manuscript map of Great Britain, which came to the Bodleian Library with Richard Gough's collection in 1809, is beyond doubt one of the most remarkable cartographic achievements of the later Middle Ages; and this fine facsimile, with its accompanying aids, will earn the gratitude of students to the Library and the Society, which have collaborated in its production. This publication in fact provides the materials, not hitherto available, for detailed study of the Gough Map. For the first time, thanks to the skill of the Oxford University Press in collotype, we have a reliable facsimile in original size and colour. A transparent overlay presents "the transcribed and conjectured place-names," many of which are not legible with the naked eye on the facsimile nor (when they are the product of Mr. Parsons's scrutiny under the ultra-violet lamp) on the original. Another overlay shows the position of the names on a modern map at 1/1M—appproximately the scale of the original.

Mr. Parsons's memoir, in the preparation of which he acknowledges Mr. Crone's assistance, is comprehensive and searching. He discusses the history and date of the map, provides a physical description, and examines its cartographic features and its place in the history of map-making. This is followed by Sir Frank Stenton's paper on the road system depicted in the map, reprinted from his article of 1936,[1] and by Mr. Parsons's invaluable "gazetteer" of the place-names with modern identifications, the fruit of much laborious study.

As to the function of the map, Mr. Parsons accepts the view of Mr. R. A. Pelham[2] that "from its design as a map for travellers it could be considered as an official map of Great Britain preserved in some central office for all to consult." As to its date, citing a recent examination by "expert palaeographers" (unnamed), he assigns it to "the latter half of the fourteenth century," more precisely—from the somewhat negative internal evidence—to the date bracket 1347–1366. Recalling that in 1928 and 1933, on the authority of another "expert palaeographer" (Sir Edmund Craster), Mr. Pelham put the date a quarter of a century earlier,[3] we may suggest that "experts" should always be named, especially when they differ.

The map has three aspects of peculiar interest: first, as a record of the medieval roads of England and Wales ("a system of national highways extending into every corner of the land," in Sir Frank Stenton's words); second, as a cartographic work of striking technical maturity in view of its date; and third, as a document in the history of mensuration. Although (as Mr. Parsons notes) the lengths of stages, given in miles, do not observe a common scale, the measures of the Gough Map have been used by some students, notably Sir Charles Close,[4] to arrive at a mean length for the "old English mile." The unit employed by the compiler of the Gough Map was undoubtedly the "vulgar computed" mile (in Ogilby's phrase), that is, the mile of popular or

[1] *Economic History Review*, 7 (1936).

[2] *Geogr. J.*, 81 (1933), pp. 34–9.

[3] International Geogr. Congress, Cambridge, 1928, *Report* (1930), p. 145; *Geogr. J.*, 81 (1933).

[4] *Geogr. J.*, 81 (1930), pp. 338–42. Revised and reprinted in his 'Geographical by-ways' (1947), pp. 12–22.

customary reckoning; and Sir Frank Stenton points to the very remarkable degree of concordance between the "customary" mileages of the Gough Map in the fourteenth century and those recorded by John Ogilby in the seventeenth. Mr. Parsons's statement that "the distances between towns seem to be 'crow-flight' distances" (*i.e.* Ogilby's "direct horizontal" mileages) is somewhat misleading and, if true, would remove the basis of Sir Frank Stenton's convincing demonstration. The reluctance of some writers[1] to derive a mean mile measure from averaging of the distances in the Gough Map is probably justified, for evidence is not lacking (Norden in the sixteenth century, Gregory and Plot in the seventeenth) that the length of the customary mile varied widely in different parts of the country.

Almost all topographical maps before the sixteenth century exhibit the characteristic limitations of the medieval surveyor, who disposed of no equipment for measuring angles other than right angles nor, consequently, of any technique of triangulation. While he often recorded distances with some accuracy, he commonly conventionalized the angular relations between points, so that his map assumed the form of a diagram designed for a special purpose, for instance the delineation of an itinerary or of a boundary line. The "survey" from which such maps were constructed may be described as a traverse, and the different parts of the map were commonly not drawn to a constant or uniform scale. Such a technique may, and indeed did, result in maps adequate for the settlement of local land disputes or the laying down of an itinerary. If however we consider the familiar difficulty of closing a traverse, it is hardly conceivable that a cartographer using this method, without any other control, could have produced a map of so extensive an area as Great Britain, relatively correct in outline (with the exception of Scotland) and in the relationship of its ports.

This is the unresolved paradox of the Gough Map, for Mr. Parsons effectively demonstrates that its framework is the road system: "When a tracing from a modern 1:1,000,000 map is placed over the Gough Map so that the position of . . . Basingstoke and Winchester agree, it is found that those of Alton and Whitchurch agree also . . . When the tracing is moved north-eastwards roughly half an inch, the positions of another group of towns—Arundel, Petworth, Chichester, Havant, Petersfield, and Portsmouth—agree." No triangulation and little astronomical control (apart perhaps from some latitudes) can have entered into the process of survey and compilation. Nor can it be supposed that nautical charts were used by the cartographer; their distinctive style of drawing (as Mr. Parsons observes) finds no echo in the Gough Map, and by the middle of the fourteenth century the makers of portolan charts had already developed a severely standardized outline for the British Isles, the influence of which cannot be detected in the Gough Map. Nevertheless the use of the magnetic compass is not altogether to be excluded, for the main north–south bearings on the map have an easterly divergence (of between one and two points) from the meridian.

Mr. Parsons reasonably conjectures that the Gough Map "represents a type, of which several copies were in circulation . . . kept at London and other centres with local details added. This would account for the local roads in Lincolnshire and south-east Yorkshire." Not less curious than the map's apparent precocity is the fact that this type, or prototype, remained submerged for nearly two centuries and had "no immediate . . . successor, or rather none has survived." Only the faintest trace of it can be discerned in fifteenth century cartography[2]; and its influence first becomes apparent in a group of early sixteenth century maps[3]—Münster's woodcut map in his edition of Ptolemy (1540), the anonymous map, drawn after 1534, in the Cotton MSS. (B.M., Cotton MS Aug. I. i. 9), and the "Lily" map engraved at Rome in 1546. Münster indeed acknowledged an English source: "Angli quoque & Poloni sua suppeditarunt regna." Features common to these maps point beyond doubt to the

[1] *E.g.* Dr. G. B. Grundy and Col. I. B. P. Karslake.

[2] In the selection of place-names by the author of the small map of England and Wales, B.M., MS Harl. 1808, fol. 9.

[3] As first noted by W. Reinhard in 1909.

Gough Map as the prototype of all three; but variants, such as those noted by Edward Lynam between the Cotton map and that of Lily,[1] suggest independent lines of descent through different copies of the Gough Map, now lost. This is a timely reminder that the material from which we make generalizations about cartographic history is fragmentary, and that many links in the chain of historical transmission are unknown to us.

The physical presentation of the facsimile is of the high standard to be expected; and the present reviewer only regrets that, even if this would have raised the price, no portfolio is supplied for the sheets of the facsimile and overlays. Two small errors have been noted in the text. In Münster's map the island off the Sussex coast bears the name Manwid (not Manwich); and one of the four Surrey rivers marked on the Gough Map is the Hogsmill (not Hogswill).

R. A. SKELTON

GLACIOLOGICAL RESEARCH BY THE NORWEGIAN-BRITISH-SWEDISH ANTARCTIC EXPEDITION

NORWEGIAN-BRITISH-SWEDISH ANTARCTIC EXPEDITION, 1949–52. Scientific Results. *Oslo: Norsk Polarinstitutt*, 1957–8. $11\frac{3}{4} \times 8\frac{1}{4}$ *inches; diagrams and plates*

Vol. III, GLACIOLOGY I: *Part* A, The morphology of the ice shelves of western Dronning Maud Land, p. 1–37. *Part* B, The regime of the ice shelf at Maudheim as shown by stake measurements, p. 39–75. By Charles Swithinbank. 1957

Vol. III, GLACIOLOGY I: *Part* C, The movement of the ice shelf at Maudheim, p. 77–96. By Charles Swithinbank. 1958

Vol. IV, GLACIOLOGY II: *Part* A, Snow studies at Maudheim, p. 1–63. *Part* B, Snow studies inland, p. 65–112. *Part* C, The inner structure of the ice shelf at Maudheim as shown by core drilling, p. 113–51. By Valter Schytt. 1958

Vol. V, GLACIOLOGY III: Seismic shooting and related investigations. 134 *pages*. By G. de Q. Robin. 1958

THESE PAPERS ARE part of the full scientific report of the Norwegian-British-Swedish Antarctic Expedition, 1949–52, the first papers of which were reviewed in this *Journal* in June 1958. The present group comprise the larger part of the glaciological publication programme, though there are still some glaciological parts to come.

The work reported here is clearly of first-rate quality and importance, and it is of great value to have the full results of this well-organized expedition in the detail given. The production of the reports is generally excellent, with good printing of both text and illustrations; however, there is one unfortunate exception to this—the printers seem quite unaware of the normal usage for setting mathematics. As there is a certain amount of mathematical analysis in Schytt's volume, and quite a lot in Robin's, this is most regrettable. The failure to put algebraic symbols in italic type sometimes makes for confusion in reading, and more serious still is the mix-up between the symbols δ (delta) and ∂ (the partial differential sign) on, for example, p. 115, and between κ (kappa) and x on p. 53, of Vol. V. Unfortunately these are not isolated examples, and the result is certainly to make the reports harder to read in the more mathematical parts than they need have been. It is to be hoped that future reports of this series will be more carefully prepared in this respect, for it is a pity to mar their general excellence in all other matters.

[1] 'The map of the British Isles of 1546' (1934), pp. 3–4.

The first three parts give the observations and deductions made by Charles Swithinbank on the ice shelves. The first gives a careful description of the five ice shelves in this region of Dronning Maud Land. It is rather a pity that four of these have to go under the names "A", "B", "C" and "D"; surely the Expedition's suggestions for less prosaic names for these features would not have been unwelcome to the Norwegian place-names authorities, and it would have enabled readers of this paper to associate the characteristics of these shelves with names more likely to last than the simple lettering. As a result of his observations, Swithinbank reaches the interesting conclusion that the extent of ice shelves is largely governed by the anchorage provided by flanking arms of the inland ice sheet or by locally grounded areas; without this the ice shelves would break up and float out to sea as tabular bergs. This suggestion is obviously of great importance in any discussion of the former extent of ice shelves. Swithinbank also discusses the features observed both at the landward and seaward edge of the ice shelves. The photographs which accompany this part, although comparatively few in number, are very well chosen, and demonstrate clearly the various phenomena to which reference is made.

The second part of Swithinbank's volume gives the results of observations on the level of snow measured relative to stakes on the ice shelf. Because of the great regularity of the shelf, these observations probably give the best estimate of precipitation that it is possible to get in a region where drifting snow is such a prevalent phenomenon, and Swithinbank analyses the observations made over a period of nearly two years from this point of view. He also shows that even the slight surface relief which does exist causes large changes in accumulation, and that the undulations of the shelf parallel to the ice front are continuously being filled in due to an increase of accumulation in the troughs, so that their continued existence must be due to plastic flow of the shelf. In the third part, Swithinbank gives details of the observations of the relative movements of the same network of stakes as was used for the regime studies. In many ways these are the most important of all the results he reports, for they give definite evidence of the strains occurring in the surface of an ice shelf for the first time. The results are derived from three surveys covering a total period of nearly two years; unfortunately, the first survey was based on a subtense base line, which subsequently proved not to be accurate enough to give reasonable accuracy for the rather small longitudinal strains that occurred in the two years. In fact the *shear* components of strain rate should be obtainable from use of this first survey, since these depend essentially on the changes of angle, which are known to the required accuracy. Swithinbank, in fact, makes use of this in demonstrating that the angles measured were varying uniformly during the whole period. This gives added confidence to the results deduced from the last two surveys, which give complete information on the relative horizontal components of velocity for the ice shelf round Maudheim. The results show that the flow was tending to diverge near to the ice front, and that the resulting increase in tensile strain rate parallel to the front is partly offset by a decrease in the strain rate perpendicular to the front. The overall spreading is such that in equilibrium two-thirds of the annual accumulation are dispersed by spreading, while the remaining third goes to replace bottom melting. These results are of great use in attempting to form theories of the flow of ice shelves, such as that proposed by Robin in Vol. V or that of Weertman[1]; the conditions for work in the two surveys conducted in Antarctic winter must have been quite appalling, and it is pleasant to be able to record how valuable they were.

The three parts of Vol. IV give the results of studies of snow banding, density and structure obtained during the expedition. In the first, Valter Schytt establishes the method used for determining what constitutes an annual layer in the snow, and makes quite a good case for using evidence from several sources, but particularly from the appearance of the snow in the various layers. In this way he makes a record of the net annual accumulation at Maudheim for the years from 1931 to 1951, and in the light

[1] Weertman, J., *J. Glaciol.*, 3 (1957), pp. 38–42.

of the regime studies this seems to be a good approximation to a record of annual precipitation. He also gives results of measurements of density, grain-size and settling of the snow as a function of depth. His method of observing grain-size is open to question, as it is not clear exactly how the weighting is made between the different grains to establish the mean diameter—the method used was for the observer to record "the mean diameter of those grains which to the observer's eye appeared to be prevalent"—but it is not clear whether one large grain was regarded as only of equal importance as one small grain in coming to this conclusion—and, unless the grain-size is remarkably uniform, the differences between possible methods of definition will affect the answer to an order of magnitude. However the same criterion was doubtless used throughout, so that his observation that grain-size did not increase with depth is probably reliable. Perhaps the most important observation, though, is that the individual crystals do increase in size with depth. Schytt here uses the word *grain* to mean an object readily identifiable as a unit in the firn (in view of the use by some of the term "glacier grain" in a different sense, it might have been preferable to call these *particles*) while a *crystal* is taken to mean a region of one lattice orientation as seen in polarized light.

In the second part of his volume, Schytt applies the method worked out at Maudheim to interpret the observations made in pits dug at various places during the voyages inland. In this way he shows that, although the accumulation varies considerably from place to place, this is attributable primarily to topographical effects and no significant change in the average accumulation value (about 25 centimetres of water per annum) takes place until the high plateau is reached, some 250 kilometres from the coast. On this plateau, however, the accumulation drops by some 50 per cent. Density measurements of the surface layers are also reported, and these appear to correlate with measurements of mean annual air temperature (full details of which are not yet published).

The third part of Vol. IV contains the results of observations of density and crystal structure made on cores obtained from a hole drilled to a depth of 100 metres below the ice-shelf surface. Unfortunately the cores were somewhat disturbed, but using the less affected parts Schytt is able to plot the density as a function of depth and to fit an empirical curve to his points; extrapolating this yields a value for the thickness of the ice shelf (since its surface height above sea level is known). The observations of crystal area show that this increases linearly at first, but that at depths greater than 70 metres the crystal size increases much more rapidly; Schytt interprets this as being caused by the ice at this level having been carried into the shelf from inland ice, while the ice above has accumulated on the shelf itself, thus being less affected by flow effects. Observation of the preferred orientation of the crystals shows that this does not change much throughout the 100 metres, while observations of the air spaces show that they cease to interconnect at around 60 metres depth. Below this the pressure inside the bubbles has been measured, and appears to be consistent with expectations down to 100 metres. Throughout this volume, full details are given of the original field observations, a feature which will make the work of great value to subsequent investigators who may wish to re-use and possibly re-interpret Schytt's observations. The clarity with which these observations are given is very praiseworthy.

Vol. V gives the results of G. de Q. Robin's seismic investigations. Although it is not divided into parts like the other volumes, it contains much more than a simple record of the depth measurements alone. Robin considers in detail the physics of propagation of seismic waves in firn of varying density, and uses his observations of both refracted and reflected waves to check the resulting theory. The volume also contains details of laboratory work and of work at the Jungfraujoch to determine the velocity of sound waves in ice as a function of temperature and density, and thus enables the refraction observations in Dronning Maud Land to be used to determine a depth-density curve. However, the main result of Robin's work is undoubtedly the seismic profile, which gives details of the surface and bottom of the ice shelf and of the inland ice sheet along the route followed. The surface profile was measured by a very

careful barometric technique, and the bottom by interpretation of reflections of seismic waves in a manner most carefully described in the report. The most striking feature of this profile is the rugged nature of the topography underlying the ice sheet; this has already been reported by Robin in his contribution to a joint paper published in this *Journal* in June 1954, though it is to be noted that the interpretation of the reflections obtained on the ice *shelf* have been altered since the publication of that paper. Finally, Robin discusses the results he has obtained, and there are many points in this discussion worthy of mention; there is a theory of flow of ice shelves, in some ways similar to that of Weertman,[1] but approached in a different way, there is a theory of the development of the undulations near the ice front which attributes them to an unhomogeneous thinning of the ice sheet when the tensile strain rate parallel to the front reaches a value too large to be accommodated by a reduction in seaward component, there is a theory of elastic bending undergone by the ice shelf at its landward end due to the action of the tides—a theory which accounts for the observed behaviour of the strand cracks, and there is a comparison between the profiles observed for the inland ice masses and the predictions of Nye's theory of glacier flow. In this latter connection it is the little ice hills that provide the most clear-cut test for the theory, a test which it appears to survive very well. There is one final point of nomenclature that arises here: in a footnote Robin explains that the features he refers to as *ice hills* have subsequently been given the name *ice rise*; however, one of the references he gives for this, Armstrong and Roberts in their Illustrated Ice Glossary,[2] defines an ice rise as "a mass of ice resting on rock and surrounded either by an ice shelf or partly by an ice shelf and partly by sea and/or ice-free land." As the hills measured by Robin were partly in contact with the main inland ice sheet, they differ from an ice rise as so defined in the same way as an island differs from a peninsula; thus, unless ice rises have not been defined as intended, it would seem that the features are different from those referred to by Robin as ice hills.

In an appendix to his volume, Robin gives a collection of representative seismic records, and these help greatly in understanding the main account of the analysis. The whole volume deserves a wide circulation so that any who are contemplating seismic work in similar conditions can have the benefit of the large amount of useful information given.

It is difficult to summarize impressions of a series of papers covering as wide a field as those here reviewed. The glaciologists of the Norwegian-British-Swedish Antarctic Expedition are certainly to be congratulated on the large amount of valuable information that they have provided; if the recent expeditions taking part in the programme of the International Geophysical Year bring back results of comparable standard, then it will rapidly cease to be true that the world's largest ice mass is its least known.

J. W. GLEN

Note added in proof.

Two further papers of the series have been published since the review above was written. They are:

Vol III, GLACIOLOGY I: *Part* D, The morphology of the inland ice sheet and nunatak areas of western Dronning Maud Land, p. 97–117. *Part* E, The regime of the ice sheet of western Dronning Maud Land as shown by stake measurements, p. 121–44. By Charles Swithinbank. 1959

These two shorter papers report two further sides of the glaciological work. The first deals very briefly with the marginal and surface features of the inland ice sheet itself, and then turns to a discussion of the geomorphology of the nunatak areas based largely on a series of aerial photographs. These photographs, like those in Part A, are very well chosen, but some of the discussion depends on the observation of fine detail

[1] Weertman, J., *J. Glaciol.* 3 (1957), pp. 38–42.
[2] Armstrong, T. E., and B. B. Roberts, *Polar Record*, 8 (1956), pp. 4–12.

in the photographs that even the excellent half-tone reproductions here supplied cannot bring out as clearly as, one suspects, the original prints. As a result of his discussion, Swithinbank concludes that the geomorphology is largely that to be expected from ice cover at the present level, with little sign of any non-glacial land forms surviving, though there is strong evidence for a higher level of ice in the past, and also for the view that at present the ice is not actively dropping in height. In the second paper, Swithinbank reports the results of measurements of accumulation made on a series of stakes spread over the 300 km. route from Maudheim to the advanced base. Analysis of the results shows that the accumulation depends primarily on the local topography; there are clear signs of orographic precipitation on the summits and also of denudation by wind in places where the katabatic winds are high, as well as of precipitation-shadow effects in the lee of high ground. These effects suffice to explain all the observed variations, and there is no sign of a systematic change in accumulation with distance from the coast—in fact the average accumulation all along the route is, surprisingly, almost identical with that at Maudheim. The paper also contains details of measurements taken at a few other locations, including two in the nunatak areas where net ablation was observed. These places were both in situations where very strong katabatic winds were experienced, as well as being in the "rain-shadow" of mountains, and these two causes, together with evaporation, are probably responsible for these rare ablation areas. The two papers add usefully to our present slender knowledge of processes inside the Antarctic continent, and continue the steady succession of valuable papers from this Expedition. J. W. G.

THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS

ZOOGEOGRAPHY: the geographical distribution of animals. By Philip J. Darlington, Jr. *New York: John Wiley; London: Chapman and Hall*, 1957. $9^{1}/_{4} \times 6$ *inches; 675 pages; maps and diagrams.* 120*s*

THE GEOGRAPHICAL DISTRIBUTION of animals, both present and past, is of great importance in the study of evolution, and both Darwin and Wallace considered that the pattern of distribution in undisturbed parts of the world was one of the proofs of their theory. The difficulty of explaining the distribution of animals on the old theory of a single centre of creation had troubled many of the early naturalists, including Buffon. In the case of birds, P. L. Sclater, a former Secretary of the Zoological Society of London, in 1857, had inclined to a belief in the existence of separate centres of creation in different parts of the world to explain the origin of the six distinct regions he recognized. It may be recalled that it was mainly the peculiar distribution of the animals, especially birds, in the Galapagos Islands, recorded in Darwin's Ornithological Note Books for September and October 1835, during his voyage in the *Beagle*, that undermined his belief in the fixity of species and led to his great work on evolution. A similar approach also led Alfred Russel Wallace independently to the theory of the evolution of species by means of natural selection.

The author of this book is a taxonomist on the staff of the Harvard Museum of Comparative Zoology and has collected animals in many parts of the world. In this work he tries to answer four questions:—What is the main pattern of animal distribution? How has the pattern been formed? Why has the pattern been formed? What does animal distribution tell about (geologically) ancient lands and climates?

The author started with a special interest in birds, then became an entomologist, and in his expeditions has collected not only invertebrates but frogs and reptiles in the

West Indies, birds and other vertebrates in South America, and mammals, birds, reptiles and amphibia in Australia. As a result he has had field experience of many of the problems discussed in his book, and having concentrated on animal distribution, rather than ideas about it, has produced a useful summary of the present position of the subject. The basic principles are based on the best known and geographically most significant animals—vertebrates—and the faunas of South America and Australia are dealt with in special detail. Lists of families are given of existing land and freshwater vertebrates with their distribution, relevant fossil record, and other important information.

In the introduction the point is stressed that zoogeographers should constantly remember that the world is a sphere, and such maps as those using the Mercator projection exaggerate the areas towards the poles, and give no real idea of the position of the continents. The author himself recommends the orthographic as the best flat map for use in zoogeography and uses this system in illustrating the distribution of the various groups of animals. The list of contents indicates the scope of this work: freshwater fishes; amphibians; reptiles; birds; mammals; continental patterns and faunal regions; island patterns; evolution of the geographical patterns, area, climate and evolution; the past in the light of zoogeography; principles of zoogeography and geographical history of man.

The chapter dealing with the past contains an interesting discussion of the interrelationships of continents. For zoogeographical purposes the past may be divided into three parts, the most recent being the Pleistocene and post-Pleistocene comprising the last million years or less. Before that is the Tertiary, 60 million years or so, which is the most significant period for zoogeography, and the distribution of animals, and especially mammals, indicates the histories and interrelationships of the continents at this time. The position of land masses in the earlier Mesozoic and pre-Mesozoic is not known with any certainty and therefore is of less significance. The author is of the opinion that the animal distributions and other evidence show that, although details have changed, there has been no great change in the main pattern of continents and climatic zones during the past 60,000,000 years.

Six main faunal regions are now generally accepted, first proposed by P. L. Sclater for birds in a paper read before the Linnaean Society of London in 1857. It might be supposed that because birds can fly their distribution would not be seriously affected by such easily crossed barriers as water gaps. But the facts are by no means so simple. There are several families of birds common in South and Central America which have never reached the West Indies, a very moderate water gap; on the other hand some families have spread widely in these islands. It is not possible to tell from a bird's physical characteristics whether it is likely to cross water barriers. Rails are usually very reluctant fliers, yet more than any other non-marine bird, they have reached and populated the most remote oceanic islands. It is all the more surprising, therefore, that in general birds can be divided into these six distinct regional faunas which correspond with the ordinary geographical areas for other groups of vertebrates. Although bird migration extends and complicates the distribution of many groups, the total effect is orderly, and birds are not scattered at random over the world. The main effect has been to increase relationships between tropical and north-temperate birds in each hemisphere, and to decrease relationship between the Old and New Worlds.

In addition to the special consideration of the various groups of animals there is a discussion of the climate and vegetation of the world and an attempt to interpret the facts of distribution. The final chapter concludes with theories of the geographical origin and history of man and refers to the fact that individual animals (including man) and their parasites and diseases can have quite different geographical histories. But the author chooses yellow fever as an example and makes the surprising statement that it was originally a disease of monkeys in tropical America and had "never reached the Old World." So far from this fanciful hypothesis being the case, yellow fever is generally admitted to have originated in Africa and to have been carried across to

America about the end of the fifteenth century together with the mosquitoes responsible for its transmission. Several epidemics of yellow fever occurred in tropical Africa during the present century and many terrible epidemics raged in Barcelona during the eighteenth century. The last recorded outbreak in Europe occurred at St. Nazaire as recently as 1908. Although clinical cases are uncommon, it still extends from the west coast of tropical Africa as far east as Uganda and the Sudan. Moreover, it has been shown to be present in the animal population, especially monkeys.

However, mistakes are bound to occur in a work of this scope and geographers and zoologists are indebted to Dr. Darlington for collecting together so much useful information, and its manner of presentation. The diagrams illustrating the distribution of various groups are very clear and show the advantage of orthographic projection for illustrating this kind of information.

EDWARD HINDLE

REVIEWS

EUROPE

GÉOGRAPHIE RURALE DE QUATRE CONTRÉES CELTIQUES: IRLANDE, GALLES, CORNWALL ET MAN. By PIERRE FLATRÈS. *Rennes: J. Plihon*, 1958. $9\frac{3}{4} \times 6\frac{1}{4}$ *inches;* 618 *pages; maps and plates. n.p.*

This book is an exhaustive study of the Celtic lands by a distinguished Breton geographer. Dr. Flatrès is well suited for the task as he is well versed in Celtic lore, has a flair for field-work and possesses a sound knowledge of the Celtic languages. Students of geography, however, will be disappointed with this work for, in spite of its broad title, it deals with the evolution of field patterns and settlement types alone. The geographer will find it difficult to understand how a large volume of over six hundred pages on the rural geography of Wales and Ireland can be written without a single reference to the problems of depopulation and emigration. Likewise, there is no mention of the transformation of the rural scene brought about by the mechanization of agriculture in modern times. Surely a title less deceptive is indicated.

The chapter headings follow the orthodox lines adopted by writers on field boundaries and settlement studies, but this fact should not be allowed to obscure the writer's unorthodox generalizations. His overall thesis is that there is basically one common rural culture along the whole of the Atlantic seaboard of Europe from Spain to Scandinavia. He maintains that the basis of this was laid down in Megalithic times and that it has been added to and modified throughout the subsequent ages. In fact, Dr. Flatrès permits open fields, enclosed fields, scattered farms and nucleated settlements to merge with one another and then to segregate out and re-emerge again in an unending sequence; indeed, he maintains that such variability of field pattern and settlement is one of the characteristics of Celtic rural culture as such. It is difficult to accept such a thesis, and few today would dare link the Celts or their culture with the remote Megalithic past. How is it that the author ignores the South-western Iron Age B culture and its maritime extensions in seeking the origins of the rural landscape we see today in the Celtic West?

Dr. Flatrès is on sounder ground when he discusses the effect of conquest by Anglo-Saxons, Vikings, and especially Normans on the Celtic countryside. He is particularly good when emphasizing the influence of the great landlords (most of them of Norman descent) who introduced foreign agricultural customs and land tenures into their estates. It is curious, however, in this context that Brittany is left out of the volume, for in Brittany no non-Celtic colonization has taken place and here, surely, according

to Dr. Flatrès's argument we should have an excellent guide to what is really native-Celtic in tradition.

The work is well illustrated with maps and diagrams, but their cartography leaves much to be desired as, too, do the photographic plates at the end of the volume. Numerous minor errors occur in the text and, unfortunately, in many cases, in a context where the author, in view of his extensive Celtic knowledge, should have been able to have avoided them.

E. G. BOWEN

VALLEY ON THE MARCH. By LORD RENNELL OF RODD. *London: Oxford University Press*, 1958. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xv+297 *pages; maps, plates and figures.* 42*s*

The academic reviewer tends to wince at the prospect of a local history to review when it is written by a local landowner and when it is principally concerned with the farms and fields nearest to the author. How often do the fields produce mist and fog and the local piety an incense to flavour the fog! How dangerous to express in a preface a hope that professional or non-local historians may be assisted by the local work! How envy-stirring to admit that the book was begun in a tramp steamer and finished in an aeroplane! How humdrum the academic desk! Yet, let it be said as soon as possible, Lord Rennell's book (like those of Lord Leconfield advertised on the dust-jacket) is one to cheer and not to wound the reviewer. Here, for once, local knowledge (down to the minutiae of fields) has been harnessed to wide reading and reinforced by a most thorough assembly of documentary material from the Public Record Office and from local archives. The photographic illustrations are generous and the reader far from Herefordshire is assisted by ten maps; the non-local historian invoked in the preface is also aided by an intelligent index. *O si sic omnes!*

The valley in the title of the book is that of the Hindwell, a tributary of the upper Lugg and a stream which for a short distance has the honour to separate Wales from England until the duty is taken over by a mill-leat. The ecclesiastical parishes concerned are mainly Presteigne and Knill, although within these large parishes manors, vills and hamlets proliferated. These valleys were on the march as well as on the March, and their colonization is one of the principal themes of the first, and most original part of the book. Chapter IV in particular makes an effective case for colonization taking the form of "fields" some 34 chains long and 10 chains wide, giving an area of around 34 acres; these "fields" were compact tracts of land of which each hamlet-settlement had a ration of from two to four; they were centred on the farm or hamlet from which colonization took place, and an access track served the cleared land, the tracts commonly lying on either side of it. Beyond the bounds of these tracts lay pasture or woodland, and eight figures in the text, some accompanied by air photographs, show how the eye can separate the tracts by the alignment of their present hedges and their relation to roads and tracks. Lord Rennell believes that these blocks of land were never involved in anything like the open field system. Certainly they were described in the language of enclosed land from an early date; but the word *selion* occasionally turns up (p. 190), and it is difficult to see why the word would be used unless at some period the strip had had some agricultural or tenurial reality.

The preface offers modest and generous assistance to "historians who paint on a wider canvas." One, who has been a miniaturist himself in his day (and may well be again), would like to thank Lord Rennell for clearing up some oddities about Presteigne and Stapleton. Was Presteigne (not in Domesday Book) a border plantation of the Norman settlement, a little Ludlow? It now looks rather improbable. Was Stapleton once very much larger than the map now shows it to be? It would seem certain.

Occasionally Lord Rennell misdirects himself and us: the foot-note on page 84 sends one to the wrong folding plan; the reference under the figures on page 53 would send one to a non-existent co-author of Professor Darby, one Tessett (*recte* Terrett, as correctly on p. x). Academics' tiresome habit of wanting full titles in foot-note references does have some practical significance if one wants to order from a distance

through a library; as do the initials of an author. There are libraries who would pretend not to know a work (as in foot-notes on pp. 18–19) without the author's initials. The final foot-note frolic seems to show Lord Rennell at his most generous, for taken literally those of pages 26–7 would seem to have elevated two medieval monastic chroniclers to the House of Lords.

M. W. BERESFORD

THE OVERSPILL PROBLEM IN THE WEST MIDLANDS. Studies in housing and industrial location, No. 1. *The Midlands New Towns Society: Prepared for the Population Study Group of the Society by* D. E. C. EVERSLEY AND D. M. R. KEATE, with the assistance of VALERIE SHAW. 1958. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 57 pages; map and tables. 4s*

A PICTORIAL SURVEY OF ENGLAND AND WALES: SECTION VI. THE WEST MIDLANDS. By M. J. WISE. *London: George Philip*, 1958. 8×13 *inches; 32 pages; plates, diagrams and maps. 7s*

It is a serious reflection on planning policy and on planning machinery that the problem of overspill in three of our leading conurbations, those of Birmingham, Manchester and Glasgow, has for so long proved intractable. Meanwhile, it is important that investigations of the problem by responsible non-political bodies, such as the Midlands New Towns Society, should continue to be undertaken and the results made known both to the public and to the planning authorities concerned. The Society's report, dealing with the Birmingham conurbation, presents an analysis of the relevant aspects of population (growth, migration and future estimates to 1976) and certain aspects of housing (estimated needs and progress to date). The report is small in size and its matter highly concentrated, consisting of a brief text supported by forty statistical tables mostly based on official sources. The essential conclusions reached are that, apart from the proportion of the overspill which could be accommodated within the existing boundaries of the conurbation, some 80,000 houses must be built outside; of these, sites for 34,000 (for the city of Birmingham and some South Staffordshire towns) could be found in adjoining county districts; and the remaining 46,000 should form the basis of two New Towns. Now this may or may not be "the only possible solution," as the report declares it to be, for the statistical evidence alone is hardly conclusive. Here the report is rather too dogmatic, especially as the possibility of distributing urban expansion among smaller centres under the Town Development Act is summarily dismissed and the question of housing densities in redevelopment schemes hardly touched upon. Above all the vital matter of a policy for industrial location is not considered. Yet these are all major issues in considering the formation of New Towns, though it is likely of course that they will be the subjects of further reports from the Society. Nevertheless the present report demonstrates amply enough the urgent need for action in the case of the West Midlands.

Section VI in the series of 'Pictorial Surveys in England and Wales' is a model of how pictorial geography should be presented. The contents include over forty photographs illustrating the landscapes of the West Midlands, many of them neatly annotated or supplemented by diagrams and sketch-maps. They are skilfully arranged so that the accompanying text not only provides a commentary on them but also serves as a concise informative account of the region as a whole. Starting with the Birmingham plateau as the core of the West Midlands, five other subdivisions grouped around it are then treated. In view of the obvious space limitation the author's selection of material is admirable, although the omission of reference to Kenilworth and to the characteristic half-timbered buildings is perhaps surprising. Railway enthusiasts might complain that the locomotive shown in Figure 1 is not the normal type used for banking on the Lickey Incline. These are trivial points however and do not affect the general success of the production. Both author and publisher, in fact, are to be congratulated on having jointly produced a booklet of excellent value at a very moderate price.

K. C. EDWARDS

AN HISTORICAL ATLAS OF WALES FROM EARLY TO MODERN TIMES. By WILLIAM REES. *London: Faber & Faber*, 1959. 10×7½ *inches; 71 pages and 70 plates; maps and diagrams.* 22*s* 6*d*

Wales has been a happy hunting ground for the geologist, ever since Murchison devised the Silurian system over a century ago. The Principality offers an equally exciting field of study to the historical geographer, for its cultural development from the earliest epochs has resulted primarily from its geographical structure.

The geographer and the historian alike will welcome this new edition of Dr. Rees's Atlas, which was first published in 1951, but is now out of print. The new edition is identical with the earlier one, apart from the correction of two minor misprints, but the population map, Plate 70(b), has not been improved by being lithographed in orange; the corresponding plate in the previous edition, which was lithographed in sepia, showed the relative population densities more clearly.

The author, who was formerly head of the department of history at University College, Cardiff, is eminently qualified to guide the student through the tangled maze of Welsh history. The successive stages of Anglo-Norman penetration, and the subsequent wars in the stubborn endeavour to win independence between 1200 and 1284, are graphically set forth in the succinctly written text and the clearly drawn sketch-maps. Plates 33 and 34, showing the medieval dioceses and the development of the Welsh Monastic Houses, are of particular interest, although the author omits to notice, as Mackinder did, that the medieval bishoprics, established after the Norman conquest, inherited more or less the boundaries of the prehistoric tribal areas. On the other hand he does point out that the Act of Union of 1536 drew the boundaries of the new shires so as to perpetuate the older Welsh divisions of cantrefs and commotes.

It seems a pity that the opportunity of a new edition was not taken to bring the Atlas more up-to-date as regards recent developments in education, industry and shifts of population. The most recent population statistics are for 1931, while the enormous developments in steel production and oil refining which have taken place in the last twenty-five years are completely ignored.

JAMES MARSHALL-CORNWALL

PORTRAIT OF THE ISLE OF MAN. By CANNON E. H. STENNING. *London: Robert Hale*, 1958. 8½×5½ *inches; 192 pages; map, plans and plates.* 18*s*

This book is written by the former Vice-Principal of the Isle of Man's public school, King William's College, who has been a keen student of all that is Manx for the past fifty years. The scope of the book is similar to that of the author's previous volume in the County Books series which was reviewed in the March 1951 issue of this *Journal*. The actual arrangement of the material is, however, more satisfactory and the text has been largely rewritten. The photographic illustrations are well chosen and carefully reproduced, though the omission of a view of Douglas is disappointing. A double-page map is provided, but it does not, unfortunately, convey a very faithful impression of the Island's morphology and suffers from a substantial difference of scale as between its northern and southern parts.

Canon Stenning has painted his portrait in terms of the Island's geology and physical geography, its fauna and flora, the main periods of Manx prehistory and history and their manifestations, both tangible and intangible, in contempory political, ecclesiastical, social and economic life. His canvas had, therefore, to be a broad one, with the result, which he anticipates in the preface, that a number of errors of detail have arisen. These are errors both of fact and of interpretation relating particularly to the physiographic and economic features of the Manx landscape; and some of them are serious. However, the stated objective was to provide "a book of suggestions for those who wish to see and understand the real Isle of Man." There is no doubt that this has been achieved; and the book should serve to stimulate, as well as to satisfy, interest in this most pleasant and absorbing of islands.

J. W. BIRCH

REPORT OF THE NATURE CONSERVANCY FOR THE YEAR ENDED 30 SEPTEMBER 1958. *London: Her Majesty's Stationery Office*, 1958. $9\frac{1}{2} \times 6$ *inches;* 119 *pages; maps, plates.* 6*s* 6*d*

In this *Journal* for June 1958 appeared a review of 'Britain's Nature Reserves', by Mr. E. M. Nicholson, who is Director-General of The Nature Conservancy. His book illustrates the twin purposes of the Conservancy: by means of research to advance our knowledge of natural processes, and so to give advice on control and conservation; secondly, to apply this knowledge in the scientific management of Nature Reserves—not forgetting the practical or economic dividend that might result. The current Report of the Conservancy amply records its progress in both directions during 1957–8, a year that saw the number of Reserves brought up to a grand total of seventy. Not surprisingly, therefore, "conservation" takes up almost a half of the Report, ranging through habitats as diverse as Woodwalton Fen and the island of Rhum. On the other hand, only about one-seventh of the Conservancy's resources is spent directly on Nature Reserves. Its other commitments and interests are accordingly reported in full: scientific advisory services included, for instance, the Red Deer Survey in Scotland, and help with the 1000 acres of heathland vegetation that suffered greatly on the occasion of the Boy Scouts' Association Jubilee Jamboree at Sutton Park in August 1957. Some of the published and well-illustrated results of scientific research, such as the Scottish Vegetation Survey, will again be of critical value to geographers. There is also a record of research grants, liaison with public inquiries, progress in educational and information services, and of international problems.

Since the time of this Report the Nature Conservancy's domain has continued to grow. New Reserves have been acquired, for instance on the coast of Aberdeenshire, and near the mouth of Milford Haven, where the Conservancy has bought the island of Skomer, with its seals and voles, shearwaters and puffins. On the distribution map (Fig. 7) the Midland region shows up as a "blank" with fewer Reserves than any other region. Perhaps this situation will change in time, because the varying industrial environments of the Midlands surely present some interesting possibilities for the Conservancy ecologists. What, for instance, of the searing effects of chronic and prolonged smoke pollution, or the prospects for land restored from ironstone working?

F. V. EMERY

THE NATURE CONSERVANCY: THE FIRST TEN YEARS. *London: The Nature Conservancy*, 1959. 7×8 *inches;* 36 *pages, plates and maps.* 1*s* 6*d*

This booklet has been prepared to give some idea of the aims and achievements of the Nature Conservancy since its foundation by Royal Charter on 23 March 1949. It was created "to provide scientific advice on the conservation and control of the natural flora and fauna of Great Britain; to establish, maintain and manage Nature Reserves in Great Britain, including the maintenance of physical features of scientific interest; and to organize and develop the research and scientific services related thereto." It constitutes, together with the Medical and Agricultural Research Councils and the Department of Scientific and Industrial Research, one of the four official Research Councils under the supervision of the Privy Council.

A place where nature is specially conserved is termed a "Nature Reserve." In other countries "National Park" may be used to describe a large Nature Reserve, but in England and Wales a National Park usually means a thinly inhabited region where the natural scenery is safeguarded for amenity and recreation. During its first ten years the Nature Conservancy has acquired full possession of a total of 61,944 acres, and in addition many areas have been leased. There are also nearly forty regions worked under Nature Reserve Agreements whereby landowners join the Conservancy as partners, a system which has worked smoothly and successfully. At the end of 1958, a total of 133,081 acres of National Nature Reserves had been established in Great Britain, of which some 75,046 were open to the public without restriction except for temporary closing of very small areas during breeding seasons, etc. This

well illustrated booklet contains an excellent summary of the organization of the Conservancy and some idea of its many activities including the various scientific investigations in the regions under its control. EDWARD HINDLE

ROYAL COMMISSION ON COMMON LAND, 1955–1958. REPORT (1958). *London: H.M.S.O.*, 1958 (Cmd. 462). $9\frac{1}{2} \times 5\frac{3}{4}$ *inches; 284 pages; maps, plates, tables.* 14*s*

In 1955 a Royal Commission on Common Land began its labours; its terms of reference were "to recommend what changes, if any, are desirable in the law relating to common land in order to promote the benefit of those holding manorial and common rights, the enjoyment of the public, or, where at present little or no use is made of such land, its use for some other desirable purpose." Much oral evidence was taken in provincial centres such as Launceston, Llandrindod Wells, Kendal, Gloucester, Exeter and Taunton. This involved time and travel and the Report did not appear until 1958.

The subject of the inquiry is very complex and involves difficult questions of law, history and land use. But it concerns not only the general public who go on common land, but also many persons who have private interests in the land. The first chapter presents "the problems of common land mainly in terms of two imaginary commons, one in the lowlands, the other in the uplands." The next five chapters discuss the problems in greater detail, especially in relation to the backgrounds of law, history and land use. The remainder of the text of the Report is devoted to the Commission's recommendations. The latter are too detailed to summarize but the main principles behind them are given in two sentences:— . . . "that, as the last reserve of uncommitted land in England and Wales, common land ought to be preserved in the public interest. The public interest embraces both the creation of wider facilities for public access and an increase in the productivity of the land."

As Professor Dudley Stamp was one of the Commissioners, it is not surprising to find that the Report is written in such a way that it is of considerable interest to geographers. He contributed a valuable appendix on "the geographical distribution of common land" which occupies nearly one-third of the whole Report. Two maps, one of which shows the estimated acreage of common land by counties in 1956–8, provide further evidence that a geographer served on the Commission. The total area of rural and urban commons in England and Wales is given as over $1\frac{1}{2}$ million acres. The volume also contains interesting shorter appendices, on "the history of common land and common rights" by Dr. W. G. Hoskins, another member of the Commission, and on "some legal problems" by Sir Ivor Jennings, the chairman. This readable report is illustrated by a well-chosen collection of photographs, many of which were taken from the air. E. W. GILBERT

RHEINLAND-PFALZ IN SEINER GLIEDERUNG NACH ZENTRALÖRTLICHEN BEREICHEN. By R. KLÖPPER and J. KÖRBER. *Remagen: Selbstverlag der Bundesanstalt für Landeskunde*, 1957. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; 608 pages*

West German geographers have in recent years joined together in a number of interesting attempts to divide their country into regions of varying types and grades. The best known is the division into natural (physical) regions described in the 'Handbuch der naturräumlichen Gliederung Deutschlands,' but rather more tentative work has been done on economic and social regions, especially in the Rhinelands. Now attention is turning to the functional relationships which underlie and do so much to explain the static features of the human landscape.

One of the first products of this new line of investigation is this study of urban spheres of influence in Rhineland-Palatinate, which is perhaps the least satisfactory of the *Länder* created in 1945. Having been assembled from a number of units of almost unbelievable economic, historical and cultural diversity, Rhineland-Palatinate is a most fitting object for a study of the functional interrelationship of its parts.

The method of investigation was by the familiar questionnaires, mainly to schools, followed by field checking. Three grades of centre were defined according to the services offered, and their spheres of influence carefully described. A further grade of overriding major centres (*Grosszentren*) was also distinguished; these are not, like the others, linked to continuous spheres of influence by ties of service to individuals, but are more in the nature of regional capitals, exerting political, cultural and economic leadership indirectly, through the subordinate centres.

The investigation reveals the usual degree of discordance between urban spheres of influence and administrative divisions. The *Land* boundaries appear particularly unsatisfactory. More than half of the highest of the three grades of centre, which provide the population with department stores, theatres, museums and so on, are towns like Bonn or Siegen, situated outside the *Land*. This is surely disquieting in what is supposed to be an independent constituent of a federal state. With the *Grosszentren*, which provide leadership in so many fields, the position is more remarkable still; three are distinguished, Cologne, Frankfurt and Mannheim, not one of which falls within the *Land*. It is scarcely surprising that from its inception *Land* Rhineland-Palatinate has been the target for a series of proposals of merger with one or more of its neighbours. Altogether this is a most interesting study, not least for its geographical and administrative implications.

T. H. ELKINS

MANI: travels in the Southern Peloponnese. By PATRICK LEIGH-FERMOR. *London: John Murray*, 1958. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 320 pages; map and plates.* 18*s*

THE PRIVATE SEA. By PETER MAYNE. *London: John Murray*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 252 pages.* 18*s*

The first of these two books about Greece has considerable interest for the geographer. For it deals, mostly, with the Mani or Maina, that remote southernmost peninsula of the Peloponnese, a ridge of precipitous mountains seemingly almost bare of vegetation but full of decaying villages bristling with feudal towers like miniature San Gimignanos, which has sheltered refugees from the wars and persecutions of more than two thousand years and conditioned them, through isolation and overcrowding, to a life of fierce independence but, as the author puts it, "wretchedly poor and overcast with sadness and, in the past, entirely shadowed by the blood feud." In spite of their bloodstained past and their still continuing vendettas, which have earned them in the rest of Greece much the same unenviable reputation as Corsicans have in France, Mr. Leigh-Fermor found them, for the most part, friendly, courteous and hospitable. Indeed, he almost persuades us that the modern Mainot is

> ". . . the mildest-mannered man
> That ever scuttled ship or cut a throat;"

and he has collected from them and from numerous other sources so much information on their history, customs, traditions and superstitions, particularly the last, as to leave very little more to be written about them, at least in English. It makes, indeed, a considerable volume; but Mr. Leigh-Fermor has not stopped there. As is well known, he is an enthusiast for all things Greek and more particularly for all things Byzantine; he has an exuberant imagination and an inveterate habit of digression. The result is that a long book has been made still longer by divagations of all sorts, from speculation on the origin of centaurs and of the headgear of Roumanian boyars to erudite but disputable theorizing on Byzantine art. "How enjoyable," he writes, "how very enjoyable and luxurious it is, suddenly to emerge from the stern labyrinth of fact onto these dawn-lit uplands of surmise!" No doubt it is, and for his readers it is amusing in small doses; but Mr. Leigh-Fermor's doses often last for several pages and his book, good as it is, would have been still better as a book, as well as a more reasonable length, if he had curbed his exuberances and stuck to his main subject. The photographs are excellent, but there is only one, inadequate sketch-map.

Mr. Mayne, on the other hand, is no enthusiast but a detached and amused, though

not unsympathetic, observer of the modern Greek scene. His book, nominally a novel set in the Greek holiday island of Poros, is, as he rightly calls it, " a documentary with additions;" and though the documentary rather swamps the novel, which has only a slight plot, the book as a whole is so lively and often so uproariously comic, that this hardly matters. Having already written with humour and understanding of Moroccans, Pathans and Pakistanis, Mr. Mayne is well qualified to interpret the minds of a half-oriental people, conditioned, as he says, "by poverty and patriarchalism" and displaying the typically Oriental traits of fatalism and an almost pathological obsession with *philotimo*, which is to a Greek what "face" is to a Chinese. In two respects, however, his picture, for all his detachment, is less balanced than that of Mr. Leigh-Fermor. He says nothing of the underlying ferocity which is seldom far from the surface of Greek peasant life and which Mr. Leigh-Fermor does not ignore, though he seems to imply that it is now sporadic only—an optimistic view in the light of events in Cyprus and of the appalling atrocities committed on both sides in the great post-war Communist revolt. Again, he gives hardly a hint of that passion for emotional politics which afflicts the modern as it did the ancient Greeks and on which Mr. Leigh-Fermor does not fail to comment. One would never realize from his pages that politics is one of the two chief diversions of the Greek townsman. The other diversion, however, is the main theme of his book, which leaves the reader in no doubt that the attitude of the average Greek male towards women is rather more than half oriental. He does not moralize about it: it is just one of the concomitants of poverty and patriarchalism, and it may change, for modern Greece, though still half oriental, is a European country where change can and does occur. Mr. Leigh-Fermor, one gathers, rather regrets this; but if it alters the position of Greek women it will have been well worth while.

L. COLLIER

MASZNAHMEN ZUR FÖRDERUNG DER PRIVATEN KAPITALBILDUNG IM PORTUGIESISCHEN REICH: Sparmöglichkeiten und Finanzierungsmethoden in Entwicklungsgebieten. By RALPH VON GERSDORFF. *Zurich: Polygraphischer Verlag AG*, 1958. $8\frac{3}{4} \times 6$ *inches;* 265 *pages.* 12.45 *fr.*

In an age when it is fashionable for poorer countries to lean heavily on foreign aid, the example of Portugal is nearly unique. Its steady climb from debt to stability over the last thirty-one years has been based on the application of Micawber's principles on a national scale, and its economic development has been largely self-financed. This unobtrusive revolution in the economic life of Portugal has attracted few headlines, and any study which throws light on this quiet phenomenon must be welcome through rarity alone. Dr. von Gersdorff's book has however less negative qualities to commend it. It consists of an analysis of the problems and possibilities of capital formation for each of the main sectors of the Portuguese economy—from farming and forestry to insurance and tourism—and for the economy of the metropolitan and overseas territories as a whole. Readers familiar with Nurkse and the spate of post-war literature on "underdeveloped countries" will find little new in the arguments, but much of the data is fresh—largely culled from the growing volume of excellent statistical material published by the Instituto Nacional de Estatística at Lisbon. This is a book written by an economist for economists, and it is not surprising that in few places (notably in a short appendix by Hermann Lautensach on the port wine region) does the landscape obtrude into the analysis. Indeed the author makes few concessions to the layman in content, and in style and structure the contribution bears a strong imprint of its origins as a research dissertation at Basle University.

PETER HAGGETT

SPAIN: a geographical background. By W. B. FISHER and H. BOWEN-JONES. *London: Chatto and Windus*, 1958. $7\frac{1}{2} \times 5$ *inches;* 222 *pages; maps and photographs.* 10*s* 6*d*

In this book Part II, "The human background," is more fitted perhaps, where relevant, to awaken the beginner to the geographical aspect of Spanish history than to pave the way, along with Part I ("The physical basis"), for the "Regional geography"

of Part III as, presumably, is intended. Errors here are few, the most notable referring to Castile, which had nothing to do in origin with the ancient "Vardulia" wrongly described as "the upper basin of the Douro" (p. 68), but had its roots in the Ebro basin, where the "Merindad de Castilla la Vieja" is still an administrative unit. Burgos appeared long afterwards as a "forward capital" (Vaughan Cornish), not a "heart." A failure to appreciate that the political centre of gravity of Spain lies inevitably on the Meseta (p. 85) is unfortunate and helps to mask the importance of the nodality of Madrid, overlooked later (p. 179). The chapter on the economic geography is well-balanced, if somewhat dated, and discusses Spain's difficulties sympathetically.

But nothing prepares for the shock of finding the fluctuating western boundary of the Kingdom of Navarre in the eleventh and twelfth centuries used in Part III to justify a regional division which would entitle a sixth-former to write "Bilbao is the chief town of northern Navarre [*sic!*] also called Vascongadas." Yet La Rioja which *was* effectively Navarrese is connected vaguely with, if not ascribed to, Aragon (p. 157). The book ends with a reference to British rule in the Balearics, not merely Minorca (p. 214).

There is much good descriptive work in Part III, nevertheless marred by extraordinary lapses: the "latitudinal" alignment of the Rias Bajas (p. 119), the "cane"-sugar of the Plain of Andalusia (p. 191), the "red and green" Baetic "granites" (p. 198) really ultra-basic rocks, for example; then the account of the Guadarrama passes is muddled (p. 172) and the site of Avila grotesquely misrepresented (p. 141). On the whole, a dismal picture of Spain is presented by the over-stressing of negative aspects and by many omissions, notably of forests.

Part I is the weakest, with too many jejune phrases. As a preface to the structure, the account of the vital Tertiary era is lamentably confused and inaccurate (pp. 17f.), and the general tectonic picture is not good, although it may be corrected from Part III. Bad editing leaves the two parts overlapping too often and even in direct contradiction: the Pyrenees of pp. 16–20 bears no relation whatever to the Pyrenees of pp. 148f., and precisely the same regions described in Figure 2 as "natural" appear in Part III as "derived in the main from the historical evolution of the human societies" (p. 117), with the same most arresting boundary line between northern and southern Spain, drawn so as to include in the northern part both Burgos and Badajoz!

Careless revision leaves some thirty errors in Spanish names, varying from the merely amusing "Montseny Sencillamente" (p. 163) to the unpardonable Extr*a*madura (*passim*). In defiance of what is said by two of the authorities recommended, by Huguet del Villar *himself* on page 379 of the work cited and by Dantín Cereceda at the Granada Summer School (*Estudios Geográficos*, IV, 11, 1943, pp. 282, 5) the word *vega* is given the connotation of *huerta*, with an "Arab" origin in defiance of Menéndez Pidal (*Orígenes del Español*, 1926, pp. 86f., 102). For this there are British precedents doubtless, but in using "latifundia" as a singular noun (l., is, has; p. 202) with plural "latifundias" (p. 186) new linguistic ground seems to be broken.

ROBERT AITKEN

THE RUSSIANS IN THE ARCTIC. By TERENCE E. ARMSTRONG. *London: Methuen*, 1958. 8×5 *inches; 182 pages; maps and plates. 22s 6d*

'. . . There is enough evidence on other topics to show that the Soviet official version of events is not always wholly true.' It is perhaps a pity that in reading Mr. Terence Armstrong's interesting and informed book, we should have to read 123 pages before meeting such an important qualification. For, by force of circumstances, Mr. Armstrong has had to rely on Soviet official sources for the bulk of his material. The result, as in so many such books about the Soviet Union, is strangely reminiscent of a Russian puppet show, but without any of the humour and warm humanity that Muscovite puppet-masters are able to convey so superbly to their audiences. It is this inhuman quality which makes the chapters on Arctic archaeology, the Siberian mammoth

and the voyage of the German raider *Komet*, by contrast, the most readable in the book. Just occasionally we get an inkling of the kind of mental climate in which the Russian Arctic explorers and scientists face their appalling physical difficulties, as when we read that Samoilovitch, the Director of the Arctic Institute, was declared "an enemy of the people" in 1937.

Nevertheless, Mr. Armstrong has performed a useful service in collating a mass of information, much of it only obtainable in the Russian language, on his fascinating subject, and has produced an excellent supplement to his earlier work on the Northern Sea Route. But how I wish he could have conveyed to his readers the exhilaration of charging at a seemingly limitless icefield as one stands on the bridge of a Russian icebreaker, clad in fur to the eyebrows, with the Northern Lights crackling overhead, the friendly companionship of men like Belousov and Khramtsov and the astonishing drinking capacity of Papanin! A mention, even, of the bugs in the cabin woodwork of the *Sedov*, or of the effects of a diet of rye bread and *passé* cod, would have helped to relieve the dryness of the official narrative. On the diplomatic and strategic aspects of much that he writes, Mr. Armstrong is a little at sea. It is unlikely in the extreme that the Russians "felt badly about the whole affair vis-à-vis Great Britain" when trying to prevent the *Komet* from proceeding further east than the Kolyma. There are good grounds for believing that it was intended simply to use the ship, after the ancient Russian fashion, as a hostage. ANTHONY COURTNEY

ASIA

ARCHAEOLOGICAL DISCOVERIES IN SOUTH ARABIA. By RICHARD LEBARON BOWEN JR. and FRANK P. ALBRIGHT, with contributions. Vol. 2 in the Publications of the American Foundation for the Study of Man, edited by William F. Albright. *Baltimore: Johns Hopkins Press*, 1958. 11 × 8½ *inches; 315 pages; maps, plates and line-drawings.* 80s

This volume is the first of a series devoted to the publication of the important archaeological work carried out in Southern Arabia by the American Foundation for the Study of Man between 1950 and 1953. The essays include an investigation of the irrigation systems of South Arabia; the final report on the excavation of the Moon temple at Mārib; an archaeological survey of Baiḥān, burial monuments in South Arabia, the Lion Riders of Timna' and imported pottery and glass from Timna'. It is a compendium of studies by experts and does not intend to provide a connected presentation of the results of the archaeological excavations and surveys. For this, the student and the scholar must consult the periodicals listed in the foot-notes. It is consequently unfair to compare the expedition's achievements with a highly integrated, limited, but extremely thorough piece of archaeological work such as Miss Caton Thompson's excavations at Ḥuraiḍah. The remarks by Richard Bowen on page 44 rather indicate that too much was attempted in too little time and with too little staff. Nevertheless, if the overall picture appears to be amorphous to the general reader, for the specialist there is much of value.

The articles of Richard Bowen on Baiḥān, on ancient trade routes and on irrigation are three of the most interesting. Some others are more especially addressed to the archaeologist or the epigraphist, although no one can fail to be impressed by the remarkable Moon temple at Mārib or the charm of the Timna' lions and their infant riders. It is useful to have all this material conveniently available, not least the Heybroek–Groom map of the Wādī Baiḥān.

The basis of ancient South Arabian civilization was the incense trade and the art of handling water. Mr. Bowen draws attention (p. 82) to the fact that the Mārib dam was an earth mound, and was used for irrigation and not for water storage. It was not its destruction that led to the downfall of the South Arabian kingdoms, but disrupted social conditions which prevented the regular repair of a normal wash-out of the earth dam. He dates the dam to *c.* 750 B.C., possibly earlier. On the subject of the trade

routes he disputes the theory that there was only one incense route from the coast to the north. He supports the view that there were probably at least two such routes. These are indicated on a map compiled by F. Heybroek: one from Aden via the Kawr al-'Awdhillah to Baiḥān, Mārib and Najrān, the other from Ḥuṣn Ghurāb (Qana) across 'Awlaqī country to Baiḥān on the one hand and to Shabwah on the other. In his archaeological survey of Baiḥān, Mr. Bowen deduces that the population was not greater than now. If this be so in some parts of South Arabia why should not many of the tanks and irrigation schemes be Islamic (Baiḥān and Mārib excepted)? In the past too little attention has been given to the achievements of the medieval successors of the ancients. The dating of cemented cisterns is a case in point. Mr. Bowen compares certain of the Baiḥān cisterns with those in Aden. But there is a great deal of medieval work in the Aden series. There is literary evidence (Ibn al-Mujāwir), and architectural features (the gated and domed tank at Ṭawīlah and those linked to medieval forts on Ṣīrah island and Jabal Shamsān) too specific to be ignored; neither can the Aden tanks be dismissed as nothing more than dams constructed across deep ravines. The Playfair tank is a circular excavated cistern and the series includes examples of several types. At this stage much deduction must be conjectural, and one cannot be dogmatic. These essays are free from baseless assertion, they are skilfully deductive and above all are frequently stimulating. H. T. NORRIS

ADEN. By SIR TOM HICKINBOTHAM. *London: Constable*, 1958. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 242 pages; map and plates.* 21*s*

THE YEMEN: a secret journey. By HANS HELFRITZ, translated by M. HERON. *London: Allen and Unwin*, 1958. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 180 pages; plates, sketch-maps.* 25*s*

Sir Tom Hickinbotham's book provides an up-to-date picture of the Colony and the Protectorates. He has been acquainted with the area since 1931 and during his sojourn held the posts of Personal Assistant to the Resident (Sir Bernard Reilly, who writes the foreword), Civil Secretary, Chairman of the Port Trust and finally, in 1951, Governor of Aden. The book is written in a style combining a narrative of Sir Tom's own experiences of peoples and places and a factual presentation of Aden's evolving social and political problems. Some may not be in agreement with this presentation but the information is so varied and entertaining that no one can fail to be interested in this concise and refreshingly unromantic book. Such vital topics as labour relations in the Colony, and the Federation scheme in relation to the Yemen have not featured hitherto. Here is an authoritative account which should be read by all who are interested in mid-twentieth century South Arabia.

The book by Hans Helfritz appears to be an expanded version of his 'Land without shade' (published 1935), accompanied by better photographs and inadequate maps which, somewhat curiously, omit the author's routes; neither is it clear when the events described took place. The account of a "secret" journey from Ḥarīb to Ṣan'ā', where the author met the late Imām Yaḥyā (assassinated in 1948) is uninformative. The narrative contains many inaccuracies. The mountains behind Mukallā (up to 1800 feet) are described on page 41 as being 6000 feet high! In Aden, "until recently rain formed the only water supply," yet if the author had read his Ibn Mujāwir, quoted a few lines later, he would have found many wells listed. The Aden tanks are not "artificial lakes." The author's Arabic spelling is baffling ("I made myself thoroughly familiar with the language" p. 16), Jabal Shamsān is "Jebel Jammar or Jam Jam," Ṣāliḥ is "Sale," Yashbum is "Yachbua," Suq al Kames is "market of the sun" (p. 154) and al-Baḥr aṣ-Ṣāfī both on page 59 and in the map looks surprisingly like—*the pure cattle.* A high standard has been set by South Arabian travellers. It takes more than flashy names such as "the Empty Quarter" to convince an enlightened public, and if the author believes "British officials and military men look upon Aden as a kind of anteroom to Hell" (p. 29) let him read Sir Tom's book—he might be surprised.

H. T. NORRIS

DEHLI: a study in urban sociology. By A. BOPEGAMAGE. No. 7 in Publications of University of Bombay. *Bombay: University Press*, 1957. 9×6 *inches;* 236 *pages; maps, plates, diagrams.* 21.50 *rs.*

This study in urban sociology attempts to approach from the viewpoint of human ecology and in particular "that discipline which aims at the study of the areal pattern and the development process of a community under varying influences and conditions." The book opens with a perhaps rather perfunctory treatment of the city's historical background and physical setting. Then there is a slight, but useful, analysis of population growth, age and sex structure and migration, followed by a discussion of industry—functional classification of the city in the sense that almost 18 per cent. of its population are engaged in "production other than agriculture," a map and some analysis of industrial location and the growth of industries, and finally a somewhat factual account of various individual industries. The chapter on housing contains a useful reconnaissance map of housing types, along with photographs by the author, and a valuable discussion—apparently on a subjective and qualitative basis—of some sociological characteristics of several contrasting residential areas. The core of the author's field-work, competence and original contribution perhaps lie in this chapter, and it is of great interest and some significance despite its limitations. Traffic and transport are discussed under the headings of roads and circulation pattern, different types of vehicle, and origin, destination and nature of local traffic—the last especially including the results of some field-work. There is a map of bus frequency. Regional links by rail, bus and air are also considered, and the chapter concludes with some discussion of distance, time and cost of the daily journey to work. The final analytical chapter reviews leisure and recreation from formal parks and gardens to clubs, doorstep gossip in different types of community, and lastly to prostitution. An important epilogue bears the sub-title "a blue-print for redevelopment." A map and discussion of six broad urban zones combine a synthesis of some power based on the preceding chapters with recommendations for redevelopment in relation to rehousing, recreation space, zoning of industry and the probable need for satellite towns.

The main part of this work might be classed as a clear and usually well-pointed compilation, growing in strength in the later chapters and suffering perhaps from lack of serious analysis chapter by chapter—and from the occasional error inevitable in tackling so large a theme from so many points of view. The conclusion is realistic, shows evidence of a great deal of field-work and, though it does not enter into costs and ways and means, is perhaps as much as a single worker can accomplish in approaching such a big task. No doubt this book has already been superseded as a working model by subsequent work by the Delhi Town Planning Organization. But its publication serves a useful purpose. It is a readable account with some of the advantages as well as the disadvantages of its origin in the efforts and mind of a single individual, and should prove useful to the citizen of Delhi and to interested readers in many parts of the world.

A. T. A. LEARMONTH

AN ECONOMIC GEOGRAPHY OF EAST PAKISTAN. By NAFIS AHMAD. *London: Oxford University Press*, 1958. $9\frac{1}{2}\times7$ *inches;* xiv+361 *pages; maps, tables, bibliography.* 50*s*

BASIC DATA OF THE ECONOMY OF PAKISTAN. By W. N. PEACH, M. UZAIR and C. W. RUCHKER. *London and Karachi: Oxford University Press*, 1959. $8\frac{1}{2}\times5\frac{1}{2}$ *inches;* xx+236 *pages; sketch-map, tables, diagrams.* 25*s*

Ever since the publication of Professor O. H. K. Spate's remarkable work 'India, Pakistan and Ceylon' many have been awaiting the appearance of works of similar worth dealing more specifically with the regions of South Asia which Professor Spate so admirably delineated and described. The process takes time, and if patience is a virtue we are amply rewarded in the shape of Nafis Ahmad's 'An economic geography of East Pakistan,' a work whose style, presentation and scholarship mark a new departure in regional studies of South Asia.

The book is divided into three parts. The first two, dealing in turn with the physical and the historical backgrounds, cover roughly one third of the book, while the third part treats of the economic geography of the present day. The whole is profusely illustrated with maps and diagrams. With such a wealth of material the book is, in effect, a regional geography of this little-known area. The themes of each of the three parts are, at first sight, relatively simple. Physically, the region is one which, though well watered and possessing some of the finest soils in India, is subjected to the effects of stream migration and the loss of fertile, silt-laden flood waters; historically, we see how local effects of foreign competition upon a once prosperous handloom industry, reverberating through time, brought about remedies and alternative occupations which have done little more than increase the pressure of population upon the land. The present situation and problems relate primarily to two things: population pressure and economic stagnation. The author makes a very good analysis of the present position and succeeds in bringing before us a very accurate picture of the problem as a whole and, by including a chapter on population, stresses the importance of the demographic factor as a key and a spur toward a solution of East Pakistan's ills.

The countryside is, as the author points out, a remarkable one, and it is a pity (as is the current fashion in advanced English geographical texts) that there are no photographs to accompany the text. A few well chosen aerial photographs would have done much to bring home the realities of this hydraulic landscape. Indeed, the major criticism of this book is that it fails to move from the general to the particular in the manner which made Professor Spate's work so useful. In the latter work the inclusion of many extracts from maps of scales of one inch to the mile, or even more, did much to illustrate the features described; there are none in this book. The existence of population densities of more than 2000 per square mile over large areas is a general feature; a few "case studies" covering such topics as the landless peasant, the fragmentation of holdings, the domestic economy of largely self-sufficient communities, the function of the local rice-mill and the pattern of rice movements, the significance in the variation of rice varieties in an area where it can be found growing in water as deep as eighteen feet would have been invaluable additions.

These and other points which might have been considered arise because of the way in which this book encourages one to want to know more. The question of ancient irrigation works, for example, in view of the Pakistani "acceptance" of Sir William Willcock's thesis,[1] is raised but not fully discussed. This is an omission of some importance, since both the East Pakistan and West Bengal governments are actively concerned with schemes which involve irrigation and water control in the Ganges delta. The omission of this and other aspects relating to the First Five Year Plan may, however, be accounted for by a delay in publication; the book appears to have been completed in 1956 but was not published until the middle of 1958.

Nothing should, however, be allowed to detract from the value of this work. It is a book upon which both author and publisher should be congratulated for the pains they have taken to produce the first definitive work on East Pakistan and for the lead they have set to others in the production of further studies on similar regions in South Asia. Nafis Ahmad's work should also be of interest to those not specifically concerned with South Asia, since by its treatment of the subject it does, in certain respects, give a definition of the scope of economic geography in under-developed countries. He has, in the opinion of the reviewer, quite rightly put the emphasis upon the importance of the physical landscape and upon the significance of the historical factor. He also indicates that in a country such as this one cannot ignore the importance of the influence of such things as world crop prices, foreign capital and so on. One wonders whether or not he has been too cautious in not giving greater prominence to the *economies* of peasant peoples. Traditionally among economists barter and subsistence economies have been generally excluded from the field of their study; equally traditionally,

[1] 'Ancient system of irrigation in Bengal'—University of Calcutta Press, 1930. First Five Year Plan, 1955–60, National Planning Board, Government of Pakistan 1957.

geographers have found these types of economies are most amenable to geographic analysis.[1] One cannot go far wrong in keeping in mind some of geography's most successful fields of activity.

The second book is, by contrast with the first, a rather bare skeleton of facts and figures, but for those who like handy compilations of statistical material, ranging from population and labour force to public finance and banking, it should be most useful. 'Basic data of the economy of Pakistan' runs to nearly 250 pages, practically one third of which are only partially used, and it is a pity that the compilers did not utilize some of this wasted space to give a little more explanatory flesh to their one hundred and nineteen tables and one hundred and five maps and diagrams. MARTYN J. WEBB

MANASLU. By YUKO MAKI and OTHERS. *Tokyo: Mainichi Newspapers*, 1958. 10×17 *inches;* 13 and 353 *pages; maps, plates.* 1300 *yen*

The Japanese have been very determined over Manaslu (26,668 ft.). It has come to be their mountain, as Nanga Parbat became the preserve of the Germans, and they richly deserve their success on a splendid peak. This book, by various members, gives an account of the expeditions from 1954–6. Already in 1952 there had been a reconnaissance, followed by an unsuccessful attempt in 1953. In 1954 the party had the exceptional ill-luck of being turned back by the villagers of Sama, to whom Manaslu is sacred, before ever they reached the mountain's foot. Undaunted, the Japanese enlisted the good offices of the Nepalese Government; in 1955 a reconnaissance party came out which, among other things, established friendly relations. This was followed by the successful attempt of 1956, led by Yuko Maki.

Only masters of Japanese will be able to read the 350 pages of beautiful close print; others will have to fall back on the short English summary at the end. Remarkable here are the clockwork planning and precision of the climbs: the two accounts of the summit ascents read like an easy day in the Alps—the second pair took only three hours from Camp VI. Another noteworthy point is the earliness in the season (May 9 and 11); also the help that oxygen gave on the final climbs.

For anybody of a serious turn this book would provide data not only on climbing, but on equipment, food, packing, oxygen, customs formalities in Nepal, communications, filming, medicine, flora and fauna, meteorology and geology, each of which has its chapter or more. Besides the pictures of the mountain and route (one could do with more of the climbing), there are photographs of meteorological portents and geological specimens. Perhaps the book will be translated; but the translator will have to be a marathon linguist. WILFRID NOYCE

IRAQ. By STEPHEN HEMSLEY LONGRIGG and FRANK STOAKES. *London: Ernest Benn*, 1958. 5½×8½ *inches;* 264 *pages; map.* 27*s*

This book is a recent addition to the 'Nations of the Modern World' series. After a general introductory chapter on the "Country and people" it is divided into two unequal parts. The first consists of three chapters dealing in turn with the "Early Ages" from the dawn of history to the Arab conquest, "Muslim Iraq" to the end of the Ottoman period, and the brief but formative twelve years of the "British Mandate." Against this historical background the authors then proceed to describe briefly the "Course of political events" from the achievement of independence in 1932 until 1958, and in some detail the "Economy," the "Machinery of state," "Society," and "Politics," this last chapter an illuminating analysis of the many conflicting influences and emotions that have assailed the state in its adolescent years. The book was at the proof stage when the revolution of July 14 occurred, and the bare facts are briefly recorded in an "Epilogue."

[1] The viewpoint of the economist in this matter is well brought out by an examination of the types of references cited by A. Hazlewood in his 'The economics of under-developed areas—an annotated reading list,' second edition, O.U.P. 1959. Forty-five periodicals are listed, not one of which is geographical, and apparently there are only two citations to the work of geographers in a list of more than one thousand publications.

The meteoric rise of Iraq, within a period of well under forty years, from the status of three remote and neglected provinces of a decadent empire to an honoured place among the nations of the world, with an importance and influence quite disproportionate to its size and population, makes a remarkable story. Only yesterday the country appeared to most western observers to be one of the most stable elements in a troubled Middle East. All that was swept away in a night and a day, and the repercussions have been world-wide. Many attempts have been made, in the resulting dismay, to apportion praise and blame for what has happened, but they have not always been based on very firm ground. The publication of this admirable study thus comes at a very opportune moment and, by reason of its objective presentation of the facts and the shrewd and balanced comments and judgements of two exceptionally competent authorities, will be especially valuable for all serious students of the subject in the perplexing circumstances of today.

The appendices include a "List of Cabinets," a "Table of administrative units," and a useful "Note on books." The map is adequate. C. J. EDMONDS

TRAVEL IN ASIA

THE CARAVAN MOVES ON (*Secker & Warburg*, 1958, 21*s*) is a spirited and highly subjective account of a journey through western and southern Turkey. The author, Irfan Orga, returning to his own country after some years abroad, is an experienced and often critical traveller, but he is never detached, and writes of all kinds and conditions of his compatriots with sincere frankness yet with broad sympathy. His portraits of the embittered radical, the sophisticated middle-class wives, the sybaritic landlord, and the humble provincial dentist will impress a traveller in modern Turkey as true and penetrating. Moreover, he can depict a landscape with clarity and feeling, particularly if it contains some ruins, and can tell a very good story. But his outstanding achievement is to describe a stay among the remarkable Yürük semi-nomads of Karadağ. The harsh yet proud and noble spirit of these people clearly moved him deeply, and his account of their economy, beliefs and customs is of considerable ethnological importance, being the first of any length in English since that of J. T. Bent. W. M. Ramsay would have delighted to read how he was affected by the space and solitude of the plateau (p. 144), an experience which confirms what he always felt about the influence of this country on the character of Paul.

Martin Hürliman has collected in ISTANBUL (*Thames and Hudson*, 1958, 25*s*) over 100 photographs, including 5 in colour, chosen with brilliance and made with rare skill. They are accompanied by short informative commentaries, and the book is prefaced with a colourful account of the city's history. The text is careful and accurate, though Selamlık is misspelt (p. 5) and "Istanbul" (p. 44) meant "up to town," not "in the city." Mr. Hürliman is an alert and intelligent guide, with as keen an eye for an unusual face in the bazaar as for an inspiring skyline or a weathered relief. The photographs of interiors may seem the least satisfactory; none convey the spaciousness of the reproduction of Fossati's drawing inside Hagia Sophia, perhaps due to the limited angle of vision of the camera lens. W. C. BRICE

In FRONTIER DOCTOR (*Hodder and Stoughton*, 1958, 25*s*) Sir Henry Holland gives an account of his life from his early days in the North of England, and is frank regarding his reaction to the clear call to be a missionary. He tells not only of his personal experiences as a doctor amongst the wild tribesmen of Baluchistan and Afghanistan, but also how through the work of the hospital in Quetta and the clinic in Shikarpur Christianity was brought to the people in a very practical way. Even though conditions were at the beginning most unpromising, and the number of converts gained was small, the gradual change over the fifty years of his service was proof of the truth of his belief and the great value of his work. This was further proved by the ever increasing support given by the rich and poor, so that when all seemed lost as a result of the

Quetta earthquake, help came from all manner of sources. Sir Henry, as a doctor, missionary and at times a Government servant, was able to reach the people as others in more limited spheres were unable to do, and thus his book tells of India and Pakistan from a new angle and with a great breadth of comprehension. His travels took him round the world as well as to many parts of India, Pakistan, Afghanistan and the Persian Gulf. He was called upon to treat Indian rulers in Junagadh and Kashmir and, to his joy, after retirement to advise upon treatment for the King of Afghanistan. He is thus able to speak with authority about the problems, conditions and peoples of the Frontier countries and provide us with a fascinating story of how through the ministry of healing he was able to win the confidence of men who had mistrusted most foreigners and who had in earlier days martyred Christian converts found in their midst.

A SHORT WALK IN THE HINDU KUSH (*Secker & Warburg*, 1958, 25*s*) by Eric Newby provides the lighter side of travel in the East. It seems a far cry from the room of a London couturière to a mountain in Nuristan, but that is the journey Mr. Newby made after very sketchy preparations, the briefest of training in rock climbing in Wales and a journey across Europe, Turkey and Persia to Kabul. His companion, Hugh Carless, a member of the Foreign Service with very strict ideas regarding protocol, had some unorthodox views regarding suitable provisions for such an expedition. Owing to a lack of boots of appropriate size, they were able to dispense with the services of the Afghan Government's official escort, an Olympic runner, and set off with Ghulam Nabi, Carless's former cook, and three Tajik tribesmen. They travelled through Panjshir to the foot of Mir Samir (19,880 feet) and almost succeeded in reaching the top. One of the sidelights of the ascent was the effect on Newby of sliding down on a steep slope on one of his crampons which were slung round his waist. They returned through Nuristan and back to Panjshir over the Arayu Pass. The descriptions of the road to Nuristan and the people are graphic and witty, with comment sometimes franker than is usual in travel books. The conversations between Newby and Carless are amusing and give great life to the story. With good illustrations and maps this is a book well worth reading and it will give many people great pleasure.

J. E. F. GUERITZ

AFRICA

PROBLÈMES HUMAINS EN AFRIQUE OCCIDENTALE. By J. RICHARD-MOLARD. *Paris: Présence Africaine*, 1958. $5\frac{1}{2} \times 7\frac{1}{2}$ *inches;* 467 *pages; maps.*

Under this rather ordinary title are collected twenty of the best writings of the late author (obituary in *Geographical Journal*, **117** (1951), p. 488), a man of outstanding wisdom and sympathy for people and things West African. These essays are for the most part a geographer's reflections upon some of the vital questions of the day in Africa. How far can the merits of the African's membership of a community and his culture be retained, while also encouraging the individual responsibility and initiative which are characteristic of Western culture and of the rapidly developing countries of the world? How may "security of the spirit" be attained, and frustration and helplessness avoided? Can Christianity become deeply rooted among African peoples where the development of personality, and even bread and wine are wholly alien? How, indeed, to be a Christian without being Western? Such are random recollections from reading "Groupements ethniques et collectivités d'Afrique Noire," "L'homme Ouest Africain," "Le nègre, ce méconnu," "La sécurité—Perspectives d'une Afrique nouvelle," "Observations sur les méthodes d'enseignement en A.O.F.," "Islam et colonisation au Fouta-Dialon," and "Propositions pour l'Afrique."

There are also some excellent interpretative pieces of work not only on the geomorphology, demography and economy of the Fouta-Dialon—Richard-Molard's specialism—but also of West Africa in general. Among these, "Les groupes ethniques d'A.O.F.," "Démographie de l'A.O.F.," and "Les terroirs tropicaux d'Afrique" are very valuable to specialists.

The brilliance of this book is further proof of the loss to the cause of racial coopera-

tion, to Guinea, and to West African geography generally by the accidental death of Richard-Molard on Mount Nimba in 1951. There are moving tributes from Professor Monod (Director of the Institut Français d'Afrique Noire, where Richard-Molard was Deputy-Director), and from Professor Blanchard, his teacher.

R. J. HARRISON CHURCH

AFRICAN ECONOMIC DEVELOPMENT. By WILLIAM A. HANCE. *London: Oxford University Press*, 1958. $5\frac{3}{4} \times 8\frac{3}{4}$ *inches;* 307 *pages.* 30*s*

Tropical Africa is still the least developed part of the world's poorest continent. As Professor Hance says: "The West today faces the tremendously challenging problem of assisting the peoples of the world's second greatest continent to bring their economic, social, and political status closer to the levels prevailing in the rest of the world." At the moment two-thirds of the area and of the males of Tropical Africa are in a subsistence economy, while the exchange economy contributes but 3·3 per cent. of free-world imports.

Apart from two valuable general chapters, this book consists of accounts of aspects of African economic development of which the author has had first-hand experience. He analyses the great agricultural achievement of the Gezira scheme, a proposed industrial one in the Volta River Project, and the proposals of the East African Royal Commission. Transport, so very basic to all African development, is the subject of another chapter, whilst the remaining studies are of three countries—the Central African Federation, Liberia and Madagascar. The latter is especially welcome in view of the paucity of material in English on that large island.

There are some odd phrases such as "below Monrovia" (p. 92) and "below Tamatave" (p. 276), and the maps are unworthy of the text. Otherwise, there is competent handling of much material, the errors are few, the conclusions sound, and there is a good bibliography.

R. J. HARRISON CHURCH

TRAVEL IN AFRICA

In his latest book, THE LOST WORLD OF THE KALAHARI (*Hogarth Press*, 1958, 18*s*), Laurens van der Post tells of his search for Bushmen of a pure strain who he believed still existed in the heart of the Kalahari desert, in conditions so harsh that intruders from other races were kept at bay. From his early childhood the author had been fascinated by the tragic story of the almost vanished Bushmen, and he communicates this fascination in his first chapters, which describe the wide extent of Bushman culture before the onslaught of Bantu from the north and Europeans from the south resulted in the near extermination of the race. Indeed, Colonel van der Post captures the reader's imagination so well that the middle section of his book, dealing with the organization of his expedition and the various abortive attempts to track down a Bushman community, seems rather long drawn out. There was trouble with the first cameraman, for whom a replacement had to be found in the middle of the expedition. Much time was wasted trying to find traces of River Bushmen in the swamps to the north of the Kalahari. An ill-starred journey to the Tsodilo Hills, where Bushmen were said to meet once a year for a short season, missed the gathering by a week. Though Colonel van der Post writes with skill and authority, and 'The lost world of the Kalahari' stands head and shoulders above the usual run of African travel books, it is with some relief and a sharpening of interest that one reaches the last two chapters, in which the search is successful. A small community of Bushmen is found deep in the Kalahari, and the author writes of their way of life, their skill at hunting, their extensive knowledge of their surroundings and their almost incredible stamina. It is a disappointment that there are no photographs of the people he so affectionately describes.

There are superficial resemblances between QUEST FOR THE BABINGAS (*Souvenir Press*, 1958, 21*s*) by Lucien Demesse, and 'The lost world of the Kalahari.' The young French author and two companions also search for a race whom they hope to find

untouched by civilization, and more than two-thirds of the book is taken up before they run to earth a band of Pygmies who at any rate spend a proportion of their time in the forest, living a nomadic life dependent upon hunting. The account of the journey to the point where the Babinga are found is made difficult to follow by the absence of even a sketch-map, and though M. Demesse and his friends certainly displayed considerable energy and enthusiasm in their task, the book is marked by a certain mild sensationalism, typified by the sweeping claim implicit in the sub-title "The world's most primitive tribe." The author's knowledge of game, too, seems to be a little uncertain and one is surprised to read a spirited description of the sounds made by the galloping hoofs of a chimpanzee.

However, the final chapters dealing with the daily life and work of the forest Babinga are surprisingly good. M. Demesse makes no claim to be an anthropologist, but he gives a plain, straightforward account of what he saw, and the Pygmies whose lives he shared for a short time emerge as distinct individuals. JEAN ROBIN

NORTH AND SOUTH AMERICA

THE HISTORY OF THE HUDSON'S BAY COMPANY, 1670–1870, VOLUME I: 1670–1763. By E. E. RICH. With a foreword by the Rt. Hon. Sir Winston Churchill. (The Hudson's Bay Record Society, XXI). *London: The Hudson's Bay Record Society*, 1958. *ins.* xvi+687 *pages. Illustrations and end-paper maps*

The Hudson's Bay Company has preserved with great care its archives from as far back as the years prior to the grant of its Charter, and a considerable portion of the documents have now been published in full by the Hudson's Bay Record Society in twenty volumes. It is on this wealth of material that Professor Rich has drawn for his monumental history of the Company. In this volume of close on seven hundred pages he gives an almost day-to-day account of the Company's activities from the tentative moves in 1665 to the Treaty of Paris in 1763, when it had survived many challenges, extended its activities to the prairies and accumulated a considerable capital.

The history begins with the arrival in England of the two Frenchmen, Médard Chouart, Sieur des Groseillers, and Pierre Esprit Radisson, of great experience in the Canadian fur trade, with their plan for exploiting the fur bearing lands of North America by the sea route to Hudson Bay in preference to the overland route from the St. Lawrence valley. Their proposal fitted in with many contemporary trends in England, the nationalistic mercantile policy, the rivalry with France, the traditional interest in the North-west Passage, and the spirit of scientific enquiry, manifested in the recent foundation of the Royal Society. They were introduced to the court of Charles II by Robert Boyle, secured the patronage of the King and the support of a group headed by Anthony Ashley Cooper, afterwards Earl of Shaftesbury, a leader in promoting overseas colonial expansion. After much negotiation and an abortive voyage in 1667, a successful voyage was made in 1668–9, when the *Nonsuch*, with Radisson aboard, wintered in the Bay, and returned with a valuable cargo of furs. The preliminary moves culminated in the grant of the Royal Charter in May 1670 to the "Governor and Company of Adventurers of England tradeing into Hudson's Bay." This gave them full rights in settlement and trade in all the seas and territories that "lye within the entrance of the Streightes commonly called Hudsons Streightes." This area was known as Rupert's Land, after Prince Rupert, the first Governor of the Company. The vague manner in which their jurisdiction was defined was to lead to much controversy later; it was finally held to comprise all the area draining into the Bay.

Professor Rich gives a most detailed narrative of the Company's activities from the point of view of the directors in London, and sets these against the wider background of general political, economic and international history. The struggles of the Company with its French rivals and interlopers, the attacks upon it on the charge of monopoly,

the difficulties in disposing of its furs to the best advantage, and many other aspects of its work are vividly described. In the early years, success depended very largely upon the shipmasters in the Company's service and a major preoccupation was in fitting out vessels in time to make the return voyage that same year. The lack of men with experience equivalent to that of the French "coureurs de bois" was a handicap in extending contacts with the Indians. This problem was finally solved by the system of apprentices. Among the first of these was Henry Kelsey, "one of the greatest figures of the Hudson's Bay fur trade." Kelsey, the pioneer in inland expansion, in 1690–2 reached the Saskatchewan, made contact with the Indians of the prairies and wintered with them. For some time, however, the Company's trading points continued to be confined to the coast, the "sleep by the frozen sea," largely because of the difficulty of maintaining inland posts. It was not until 1754 that Anthony Henday made his great journey from York Fort (Port Nelson) on the Bay to the Saskatchewan, and thence in a general south-west direction to about long. 114° W., within sight of the Rockies. He was probably the first white man to witness a buffalo hunt. The volume is provided with two end-paper maps—on one of which an error has been made in numbering the parallels—but it is not easy to follow these journeys upon them.

Directly based as it is upon the primary documents, this will long remain as the standard history of the Company. The general reader may feel that some concession might have been made to him by summarizing at intervals the general trend of the events narrated in such a profusion of detail.

G. R. CRONE

THE SOUTHEAST IN EARLY MAPS. With an annotated check list of printed and manuscript regional and local maps of southeastern North America during the colonial period. By WILLIAM P. CUMMING. *Princeton, N.J.: Princeton University Press*, 1958. 11 × 8½ *inches;* ix + 275 *pages; plates.* 100*s*

Professor Cumming describes his work as "a study of the historical cartography of the southeastern region of the North American continent before the American Revolution." In both historical and geographical senses this is a sufficiently homogeneous region to merit such a distinct study, which it has not hitherto received. The book is in two parts: an introductory essay and a full catalogue "of all regional maps of the Southeast and of local maps south of Virginia and north of the Florida peninsula." It is illustrated by 64 brilliantly clear collotype reproductions made by the Meriden Gravure Company.

The catalogue, from which world maps are excluded, is in chronological order and may be considered a model of its kind. A full cartographic and bibliographical description of each map is given; its historical significance and relationship to other maps are elucidated; locations, reproductions, and references are listed. The author's search of the repositories in which his material is preserved has been extremely thorough. The reviewer has been able to note only one English map which has escaped attention (an unimportant one which need be mentioned only because Professor Cumming, while modestly admitting the probability of omissions, sets out to produce an "exhaustive" list): this is a MS. map of Carolina copied by William Hack, from Ogilby's 'First Lords Proprietors Map' of *c.* 1672, into a sea-atlas of the North American coasts completed about 1690 and now in King George III's Maritime Collection in the British Museum.

The introductory essay, which is written in a notably lucid and urbane prose, divides the cartography of the region into three phases: primary, transitional or descriptive, and modern. A critical distinction is made between "type maps" and derivatives, and helpfully illustrated in diagrammatic form (Appendix A)—a device much to be commended. Professor Cumming's discussion is distinguished by the skill with which he juxtaposes the complementary evidence of maps and documents. This is exemplified (for instance) in his analysis of the evidence for a settlement on the Roanoke River before 1657, of the controversial issue of John Lederer's discoveries in 1670,

and of the political overtones of the MS. map in the Public Record Office (*c.* 1721–4) ascribed to Colonel John Barnwell.

This outstanding book not only illuminates many aspects of cartographic history; it will also be an indispensable tool for the historian of the region in the period of its colonial development. R. A. SKELTON

TRAVEL IN SOUTH AMERICA

Which will produce the better book, the journey undertaken with publication in mind, or the journey of which the account is incidental to its main purpose? In WITH GRACIELA TO THE HEADHUNTERS (*Barrie*, 1958, 21*s*) Alfred Boeldeke describes his crossing and recrossing of equatorial America, with occasional house-parties with Indians and others on the way. His wife and daughter, Graciela, accompanied him. Their presence, the reader suspects, was more to provide a variant on the familiar pattern of stories of difficult journeys than because they were desperately anxious to go. Endurance the family must have had, but there is little in their adventures which will not be familiar to the reader of South American travel. It will be interesting to see whether Graciela as an adult has any *wanderlust*. In ACROSS THE RIVER OF DEATH (*Souvenir Press*, 1958, 21*s*), Jorgen Bisch, very much a professional, writes about "true adventure in the green hell of the Amazon." Other professionals will find it hard to beat at least one incident, for this author voluntarily enters into a fight with an anaconda. He also saw two rhinoceroses by a river, a very surprising observation. This book is a translation. Perhaps to Danes frequent successions of paragraphs each consisting of no more than a single sentence, and sometimes not even that, is an acceptable way of writing narrative, but in English it soon becomes wearisome.

Reading PERUVIAN ADVENTURE by Will Brown is a very different experience (*Hale*, 1958, 18*s*). The author is young, a member of an undergraduate expedition to the Andes to collect mice. Allowing for a few naïveties of youth, he is an excellent writer. We are caught up with the preparations for the expedition and held in its course. The expedition's purpose, topical and of considerable importance, is clearly explained. The mouse is not native to South America, it arrived there with the invading Spaniards. For a known time those of high altitudes have been subjected to considerably higher natural radiation than the laboratory mice of Europe. Has this had genetic consequences? The answer is not yet known, but at least a sample of Andean mice is now under observation. The experiences of this group of resourceful young men and their reactions to travel and Latin America are delightful reading. They, like all other passengers whose pockets do not match their taste for cultured living, found that subterranean passage which in every liner connects the squalor of the third class with the grandeur of the first, but how many have described the traverse so entertainingly? Other undergraduates contemplating expeditions will profit from their frank descriptions of how they raised the money, but senior academics will be sorry to have revealed the techniques for penetrating their defences. The author skilfully conveys the attitudes of the Peruvians of various altitudes to the mouse-catching undergraduates and his descriptions of the tough, predominantly male, mining camps perched high up in the Andes are memorable. These curious South American communities go unsung, while the Jivaros put on yet another head shrinking dance for the visiting professional. PETER BELL

POLAR REGIONS

POLAR ATMOSPHERE SYMPOSIUM: Part I, Meteorology Section. Edited by R. C. SUTCLIFFE, F.R.S. *London: Pergamon Press*, 1958, *for* AGARD (Advisory Group for Aeronautical Research and Development, NATO). $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xi + 341 *pages; maps, diagrams, plates.* 70*s*

Once upon a time the atmosphere was a nice simple affair that any geographer could understand. Air flowed over a surface with given properties and that was that; incoming radiation was in excess in the tropics, outward radiation became

predominant towards the Poles. There were trade winds and monsoons; in high latitudes there was a steady outflow of polar air; and around the Pole itself a virtually windless anticyclone was to be presumed. Geographers long continued to hope that somehow this pleasant terrestrial model of their childhood would be found to prevail. In a memorable effort Hobbs tried to claim that Greenland instead provided the desired "pole of the winds;" but this has long been refuted. Decade by decade the atmosphere more and more becomes, in Sutcliffe's words "a structure of staggering complexity." Even the fronts of 1925, the air masses of 1940, are no longer what they were. There are winds at the Poles, and vast surges of air buffet the ice to and fro across the Arctic Basin. Even the Antarctic continent fails to provide its fixed and permanent anticyclone. We must develop our concept of an ice sheet as an eternal battleground between static and dynamic agencies, as Loewe showed in his Symons lecture for 1936.

Polar anticyclones indeed form; cold caps of surface air with ferocious ground inversions develop rapidly; but they are shallow. They wobble from side to side of the Poles and may even for brief spells be dissipated by the energy of those overriding upper westerlies we now know. Yet every winter the temperate lands of the Northern Hemisphere are rudely reminded that there is an Arctic which now and then can maintain a very persistent supply of polar air. February 1947 remains memorable; and even in June there befell the fascinating chill of Coronation Day, 1953. In February 1956 the fiercest outflow missed us, but from Holland to Marseilles it gave what was probably the coldest February in 250 years. What factors govern the location, extent, intensity and persistence of such spells?

This question like many others can no longer be answered in terms of geography; meteorologists have now left the ground. At this symposium, held in Oslo in July 1956, twenty-four papers were presented. They are here reprinted, together with a general introduction by the late Dr. H. U. Sverdrup, whose work on the *Maud* in 1918–24 ranked him as the doyen of Arctic meteorology. With Dr. Sutcliffe as editor, the other twenty-three authors include two from Canada, five Norwegians, twelve from America, three Germans and one Swede.

While the papers are addressed by experts to an audience of experts, the informed can read them, together with the resulting discussions, with profit. To geographers Professor Hare of McGill will be best known; he contributes a short but thoughtful introductory paper on Arctic geography and climate with a pleasant résumé of the ways of defining his region. In a second paper on the quantitative representation of the North Polar field, Hare describes the mode of attack by his McGill Group, now in progress, on the problem of specifying the character of the polar atmospheric circulation, both at the surface and at the 500 mb. level.

As Sverdrup says, polar meteorology differs from tropical meteorology in that instability is of less importance; the most important energy transformations are related to processes of radiation, whereas in the tropics they derive from the addition of latent heat through condensation of water vapour. Hence the growth and dissipation of inversion layers in one way or another occupies the attention of several contributors. There is also a paper by Johansen on the relationship between meteorological conditions and the amount of ozone over Tromsö; the effects of the absorption of radiation at high levels must not be forgotten.

We are provided with an exposition of current meteorological ideas of the behaviour and characteristics of Arctic air at both low and high altitudes. Wexler and Moreland indeed take us up to the pressure field and winds at 20 km. Scherhag develops further the implications of the sudden warming of the high-level stratosphere shown by the Berlin observations in February 1952 and again in March 1954. Displacements of the circumpolar vortex at 500 mb. are discussed by Flohn in a suggestive paper. Belmont summarizes the present state of research in Arctic meteorology. Hesselberg and Johannessen comment on the signs of a possible cessation of the twentieth century amelioration of the Arctic climate.

There is a current fashion for publishing the results of symposia, often at considerable

cost. The informed reader, eager to know how ideas are evolving, will find this collection of papers useful. Yet the occasion implies that perforce we can be told little of the extensive Russian contributions. Many geographers will continue to await with eagerness the future integration of the many suggestive ideas contained in this assemblage with the results of Russian field-work, not forgetting French, Danish and British studies in Greenland. For Europeans, and for Russians in particular, the ultimate issue stands: why do the seasons vary, and how much energy must we expend in order to defy the cold and to maintain civilization in its accustomed latitudes? Let the hope be expressed that we shall not have to wait too long before the results of the I.G.Y. appear.

GORDON MANLEY

PACIFIC OCEAN

THE SOLOMON ISLANDS: geological exploration and research 1953–1956. By JOHN C. GROVER, with chapters by P. A. Pudsey-Dawson and R. B. M. Thompson. *Mem. Geol. Survey Brit. Solomon Ids.* 2 (1958). 13×8 *inches;* viii+151 *pages; maps, diagrams, plates.* 40*s*

This report by the senior geologist of the British Solomon Islands, with chapters by his two assistant geologists, gives an account of the results of three years' work by this small staff, assisted by a secretary, a draughtsman and native assistants, collectors and porters. It supersedes the interim report on the Islands published in 1957. The only important earlier account of the geology of the Solomon Islands is H. B. Guppy's book published thirty years ago. The present author gives full credit to Guppy for his remarkable pioneer work. Fundamental mapping has been the principal aim of the Survey and as a result maps are presented of parts of Guadalcanal and San Cristoval, the Florida group, all in colour, and a black-and-white map of the Shortland group. In addition to this fundamental mapping and descriptions of the igneous and sedimentary rocks, many deposits of possible economic importance, including old workings on Gold Ridge in Guadalcanal, have been investigated. Others are: old prospecting sites in San Cristoval, where in the 1930's prospectors are said to have sought for tin; alluvial ilmenite on Malaita; likely looking phosphates on Bellona and less promising phosphates on Rennell Island, a fine example of uplifted atoll; and, lastly, a general assay for nickel and cobalt in ultrabasic rocks and derived laterites from several islands of the group.

All these investigations make an impressive showing, but there is more besides geology in this report. Part I gives general information, such as would be needed by a newcomer to the islands proposing to carry out work on any of the possible mineral deposits. There is some account of the people, their languages and agriculture, the work of the Missions, of communications and water-supply. Further notes on the natives and more general information are given in the accounts of Malaita, San Cristoval and Rennell Islands, and others. Mining policy is described in a separate chapter.

The author is concerned about the need for oceanographical investigations particularly to plot the currents and revise the charts, both of importance to the safety of small ships and native boats. Returning to needs more closely associated with geology, he stresses the need for a gravity survey of the sea floor and, impressed by the evidence that old eruptions of the now dormant Savo volcano have been of the "glowing cloud" type, he has made arrangements for temperature records to be kept on the island; he urges the need for the building of shelters and for early warning messages of impending eruptions to be sent so that relief and rescue operations may be set on foot.

W. CAMPBELL SMITH

PHYSICAL AND HUMAN GEOGRAPHY

DAS EISZEITALTER: Grundlinien einer Geologie des Quartärs. By PAUL WOLDSTEDT. Second edition. Vol. II. *Stuttgart: Ferdinand Enke Verlag,* 1958. 9½×6 *inches;* vii+438 *pages; maps and illustrations.* DM. 69

Publications on the Quaternary Era in its various aspects are now pouring out with

the proportions of an avalanche. To make this material available in condensed form there have appeared in recent years P. Woldstedt's 'Das Eiszeitalter: Grundlinien einer Geologie des Quartärs' (1929), W. B. Wright's 'Quaternary Ice Age' (second edition, 1937), R. Klebelsberg's 'Handbuch der Gletscherkunde und Glazialgeologie' (2 vols., 1948/49), J. K. Charlesworth's 'Quaternary Era' (2 vols., 1957) and R. F. Flint's 'Glacial Geology and the Pleistocene Epoch' (1947) and 'Glacial and Pleistocene Geology' (1957). A second edition of Professor Woldstedt's book, completely revised and rewritten, is now being published; volume I appeared in 1954 (see review, *Geogr. J.*, **122** (1956), p. 268) and volume II (here reviewed) in 1958—volume III is not yet out. Volume I (374 pages) was concerned with the overall picture, volume II (438 pages) covers Europe (including British Isles, Poland, Ukraine, Hungary) and the Mediterranean lands (including the Balkans, Near East and North Africa) and volume III will deal with the rest of the world.

This volume (II) has inevitably expanded beyond principles (*Grundlinien*). It has indeed become a well-documented treatise of Quaternary stratigraphy in which each region is treated chronologically and with a great wealth of detail. The descriptions of the events, physical, climatic, faunistic, floristic and human, of glacial, interglacial and interstadial, late-glacial and post-glacial times, are accompanied by numerous pollen analyses and radiocarbon datings, by sections, diagrams and maps and by 24 most helpful, if tentative, correlation tables. The result is a most welcome and authoritative account of our present knowledge in this part of the Old World. The final bibliography, supplementing that in volume I, occupies 29 pages; few titles are earlier than the present century and the vast majority belong to the last 25 years, many to the last three or four years.

Attention may here be drawn to two of the author's main conclusions: first, that the pluviations, though contemporaneous with the glaciations, were not secondary effects of the latter but were due to primary atmospheric changes; and secondly, that the four glaciations of Penck were preceded by two earlier ones, *viz.* an older, Brüggen, and a later, Eburon, glaciation separated from each other by a Tegelen warm period and from the succeeding Günz by a warm period. In the reviewer's opinion, the question of these earlier "glaciations" is still open; they may, as the author suggests, be of equal rank with the classical Alpine four; they may, however, be no more than the later members of an ascending series (? Günz 1, 2, 3), for the physical evidence is incomplete and difficult to interpret and the impact of glaciation upon life, plant and animal, at that early date was scarcely discernible. It is indeed becoming increasingly clear that the climatic changes of the Quaternary were much more complex than has generally been assumed.

J. K. CHARLESWORTH

ELEMENTARY SEISMOLOGY. By CHARLES F. RICHTER. *San Francisco: W. H. Freeman*, 1958. (*Agents: Bailey Bros. & Swinfen, London, W.C.*1). $9^1/_2 \times 6^1/_4$ *inches; 768 pages; plates, maps and figures.* $ 12.00

The qualification in the title that this book is an elementary exposition of seismology will perhaps be regarded by most readers, except specialists in the mathematical theory of elasticity and crustal dynamics, as an understatement. Professor Richter would appear to have considered all aspects of seismology in this wholly admirable book and, although mathematics intrude very little except in the appendices, his presentation has that fortunate blend of theory in relation to the facts of global incidence which characterizes the publications of the Seismological Laboratory in Pasadena. Moreover, due attention is paid to the practical problems of earthquake risk and civil construction. Professor Richter is joint author, with Professor Gutenberg, of the 'Seismicity of the Earth' which was reviewed in the *Geographical Journal* for March 1957, and he was responsible in 1935 for the formulation of an instrumental scale that is now the recognized scale of magnitude throughout the world.

The book is divided into 33 chapters and 17 appendices. Chapters 1–24 are grouped under the "Nature and observation of earthquakes," while the remaining chapters are

concerned with the geographical distribution and geology of earthquakes. The 99 pages of appendices are largely mathematical, and have numerous charts and tables, concerned for example with transit times in relation to focal depth. The author first discusses two sample earthquakes, the Neapolitan one of 16.12.1857 described in the classic memoir by Mallet, and that at Whittier, California, of 8.7.1929. Mallet's account is probably the first detailed scientific account of an earthquake, and is noteworthy for the careful recording of degrees of damage and direction of displacement of objects. The Whittier shock is of historical importance, not because of its magnitude (it was 4·7), but since it occurred just after the installation of very accurate recording instruments in South California and was the subject of expert study. The impulses recorded by the aftershocks of this earthquake led to the conception of waves polarized by reflection from the Moho. discontinuity.

There follow chapters on some great Indian earthquakes, earthquake effects on buildings, and descriptions of volcanic and tectonic earthquakes. Tectonic shocks receive a double treatment, inasmuch as Part II describes in more detail conditions in California and New Zealand which had already been more generally discussed in the earlier chapters. The discussion of tectonic earthquakes is of particular interest in the evidence presented from precision surveys of distortional movements adjacent to active faults. Whitten's conclusion in 1948 that the outer coastal area of California is moving north-west, relative to the interior, at the rate of 5·0 centimetres a year has given assurance to geologists who have been led more and more to postulate strike-slip faults. Such a movement, if continuous and regular, would involve a displacement of 31 miles in one million years, or since the beginning of the Pleistocene, and is of the order of magnitude of displacements postulated on geological grounds in, for example, Venezuela, the West Indies, Scotland and India.

The numerous illustrations are excellent, and the standard of production is good, although in the particular copy under review pages 537 to 568 are inverted and reversed. The book is in fact the best now available in the English language and should be read by seismologists, geologists and geographers. J. B. AUDEN

AVALANCHE. By JOSEPH WECHSBERG. *London: Weidenfeld & Nicolson*, 1958. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 190 *pages.* 16*s*

This book is an account of two avalanches which overwhelmed the Austrian village of Blons, in the Grosswalsertal, Vorarlberg, on 11 January 1954. The early chapters, attempting to give the background to the disaster, are disjointed and a little tedious. The scientific premonitions of Dr. Krasser, in charge of the Avalanche Warning System, though naturally valid for the regional and general, would require an omniscience quite unattainable in the face of the caprice of local and individual conditions, if applied specifically to what happened in 1952 and 1954 at Langen and Blons. The narrative takes on interest when the author turns to the village and its inhabitants, after the sunny morning of January 8 gave way to the first major snowfall, and storms continued for the next three days. Local apprehension is built up by the visit of Eugene Dobler to his mother, and is carried on to Cassagrande Jenny. The first avalanche struck at 9.36 a.m. on the 11th, and swept everything away of the eastern hamlet of Walkenbach over a path 400 yards wide. This was disaster enough, for the village was cut off from its neighbours by snow drifts, the telegraph lines were down, and the storm prevented anyone in Raggal, on the opposite side of the valley facing Blons, from realizing what had happened. Rescue teams saved some of those buried in the snow and debris, and brought them to supposed safety in the main village. At 7 p.m. another avalanche started from the Montcalv and, going through a funnel only 80 yards wide, destroyed most of Blons. The rest of the book describes the agonies and fortitude of the buried, and heroism of the rescuers. Two sisters were not recovered for 50 hours, one of them pinioned upside down by the beams of their shattered house. Once contact with the outside world was established, and medical help arrived with helicopters, many of the villagers, perhaps from shock, displayed a callous indifference,

and even refused assistance in the search for still vanished neighbours. Almost as a footnote the author states that 6000 Austrian soldiers were killed within 48 hours on 13–14 December 1916, by avalanches that had been deliberately set in motion as a weapon of war. There is no quantitative measurement of horror, and such a figure in no way lessens the appalling disaster which swept down on Blons; but another account would be of value, of the perversion of Alpine knowledge, which could liberate the latent forces of nature under such a cosmic setting for such terrible strategic ends. The author would appear to have dealt somewhat freely with Dobler's diary, for it is surely the server and congregation who would have said "Sed libera nos a malo," and well indeed they might.

J. B. AUDEN

ARID ZONE RESEARCH. Conducted under the auspices of UNESCO. *Paris: Unesco, 19, avenue Kléber, Paris, 16.* $10^{1}/_{2} \times 8$ *inches; maps and diagrams*

VOL. IX. GUIDE BOOK TO RESEARCH DATA FOR ARID ZONE DEVELOPMENT. 1957

This book was planned as a guide to scientists and technicians working on development projects in the dry areas of the world. The underlying precept of the arid zone research carried out by UNESCO is that all specialist efforts should be closely integrated and that all technicians should be aware of the full implications of development problems. A number of authorities were therefore invited to outline the basic research problems in their own particular research fields and to give some indication of the techniques that have been developed to overcome them.

Thirteen separate fields of investigation are included under the headings of: "Mapping," "Climatology," "Geology and geophysics," "Geomorphology," "Hydrology," "Soil resources," "Vegetation," "Forests," "Population," "Land tenure," "Animal husbandry," "Nutrition, health and sanitation" and "Sources of energy." The quality is, almost inevitably, very uneven and the approaches very different. The chapters on mapping, climatology, geology, hydrology, forests, population and health merely deal with generalities, with hardly any reference to the specific problems of arid areas. The section on hydrology certainly covers a vast field but is so compressed as to be most obscure.

The chapters on vegetation, soil resources and sources of energy, by W. G. McGinnies, Herbert Greene and E. W. Golding respectively, are more satisfying in that they not only deal specifically with classification in dry areas but they also give practical suggestions for the organization of surveys. The section on geomorphology by C. S. Christian, J. N. Jennings and C. R. Twidale is also interesting in that it contains a generic scheme for land-form mapping with examples of completed maps for parts of semi-arid Australia. The most stimulating chapter, however, is that on animal husbandry by R. O. Whyte; here the physical and historical aspects of pastoralism in the dry lands of Africa, Asia, Australia and North America are viewed together in a clearly-written piece of comparative human ecology. The bibliography to each chapter is substantial and valuable.

VOL. X. CLIMATOLOGY, REVIEWS OF RESEARCH. 1958

The eight review reports presented here were intended as a background to the eight sessions of the Canberra Symposium on Microclimatology held in 1956. The authors have reviewed the current state of knowledge on the selected aspects of climatology with particular reference to the arid zone. One of the most striking features of the book is the comprehensive bibliography to each section. The section on evaporation rates and the water balance is by E. L. Deacon, C. H. B. Priestley and W. C. Swinbank. Various important aspects of water loss to the atmosphere are here placed in their proper perspective. A parallel section on radiation and the thermal balance by A. J. Drummond deals with recent discoveries and research methods with particular reference to the work done in the U.S.A., Great Britain and southern Africa. The section on animal ecology in the arid zone is by F. S. Bodenheimer and, by a skilful

use of a few examples, the author illustrates the general principles of animal distribution in relation to the microclimates of environments. In the section on vegetation distribution in relation to climate A. Vernet draws his examples chiefly from North Africa. This section would be valuable merely for its vegetation map of Tunisia. An entire section is also devoted to the "Proprioclimates of man and domestic animals." Here Douglas H. K. Lee deals with heat and water vapour transfer through the hair of domesticated animals and through the clothing of human beings. This is followed by a section by E. M. Fournier D'Albe which summarizes the multifarious effects of vegetation and human activity on the microclimates at and beneath the soil surface and indicates the modes of thought that are necessary for an attempt to modify the microclimates of arid regions with a view to crop cultivation. The penultimate section by E. Eriksson is devoted to a discussion of atmospheric transport of sea salt and other solids and the possible repercussions of this on the chemistry of soils in arid regions, while the last section deals with the special requirements of the arid zone so far as climatological observation is concerned.

This book is extremely valuable, since it fulfils the double role of whetting the appetite for a protracted diet of microclimatology and bioclimatology, and of providing a bibliography as a guide to the wherewithal to satisfy it.

VOL. XI. CLIMATOLOGY AND MICROCLIMATOLOGY—PROCEEDINGS OF THE CANBERRA SYMPOSIUM. 1958

It is quite impossible in the space available to give even a brief indication of the factual content of this remarkably valuable volume. The text and total bibliography together provide a comprehensive view of the present stages of research in most aspects of microclimatology and the climates experienced by living things. Fifty separate papers were presented at the Canberra Symposium by eminent specialists from many parts of the world. The nature of these papers varies between mathematical models of physical processes and intriguing accounts of animal and plant responses to weather changes and climatic contrasts. The scene is set by a stimulating introduction on arid zone climatology by C. W. Thornthwaite. S. R. EYRE

AN INTRODUCTION TO TROPICAL AGRICULTURE. By SIR HAROLD TEMPANY and D. H. GRIST. *London: Longmans*, 1958. 9×6 *inches*. xvi+347 *pages; maps, plates and colour plates*. 40*s*

This important book was begun by the late Sir Harold Tempany and completed at his request by D. H. Grist; Dr. H. Greene, of Rothamsted, contributed the chapter on soils. It sets out "to provide a logical and coherent account of the background to agriculture in the tropics, showing its main points of divergence from agriculture in other latitudes" (p. xvi), and is intended not only for students but also for agricultural officers in the tropics. The book is organized in three parts. Part I is entitled "The tropical background;" it covers climate, vegetation, soils, types of agriculture suited to the Tropics, and European influence, and concludes with a particularly interesting, valuable and well-written account of the history and present state of agricultural research in tropical areas. Part II ("Agricultural practice") contains eleven chapters on subjects ranging from soil conservation and agricultural systems through irrigation and pests to the processing and storage of tropical agricultural produce. Part III is headed "Economic considerations" and deals with marketing, transport, land tenure, finance and credit.

The authors have managed to digest a vast amount of material in the preparation of their book; their valuable bibliography runs to 211 items. Inevitably there are some misleading condensations. Not so inevitably, but very unfortunately, they have not made it easy for the reader to see the wood for the trees and to come away with a crystal-clear idea of the "main points of divergence" between tropical agriculture and agriculture elsewhere. Some of the trees need not have been there at all; for example, it is hardly necessary to discuss elementary general principles of climatology and soil

study. But perhaps the main trouble arises from the attempt to serve two masters, the student and the research officer: parts of the book contain too many trees for the general view required by the former and not enough to satisfy the latter though it does supply the agricultural officer with much-needed information on territories other than his own. This is not, then, a book animated by the generalizing power of a Pendleton, or the scholarship, grip of essentials and expository genius of a Gourou; but it is important and valuable nevertheless, and should be consulted by all geographers and others interested in the Tropics. B. H. FARMER

GÉOGRAPHIE DE LA POPULATION. Tome 2. By JACQUELINE BEAUJEU-GARNIER. *Paris: Librairie de Médicis*, 1958. 10×6½ *inches;* 574 *pages; plates, maps, tables, graphs and diagrams*

Volume 1, dealing with generalities, Western and Southern Europe and its projection by emigration to the U.S.A., Canada, Australia, New Zealand and Latin America, was noticed in the *Geographical Journal*, **124** (1958), pp. 262–3. This final volume, which deals with Africa, the Middle East, Monsoon Asia, and the Socialist Lands, maintains the very high standard of the first volume. There are many case studies of peoples and problems, a conclusion rounds off the two volumes, and there are author and general indexes—the latter showing major references in strong type. These volumes will rank with the greatest French geographical writings.

R. J. HARRISON CHURCH

HISTORISCHE RAUMFORSCHUNG I AND II. Forschungsberichte des Arbeitskreises 'Historische Raumforschung' der Akademie für Raumforschung und Landesplanung, Band VI, Band X. *Bremen-Horn: Walter Dorn*, 1956 *and* 1958. 9½×6½ *inches;* 154 *and* 98 *pages; maps*

These two special publications of the Akademie für Raumforschung und Landesplanung remind us that studies about the use of territory can be conducted profitably without being strictly geographical. The academy's main preoccupation is with the present use of land, and with wisely planned development. These publications deal with different periods and countries. Short articles deal with the north-west of the Roman Empire, French Huguenot settlement in Hessen-Kassel, mercantilism, the use of water in the ancient Middle East and the past space-problems of Central America, Egypt, and Turkey, but the burden of the volumes is carried by four longer articles.

In Volume I Dr. Heinz Stoob discusses the cartographic representation of towns rising in Central Europe between 1450 and 1800. This is an interim report upon the methods required in such cartography, the vocabulary used in records that describe a town and the main marks of urban status. The work is made difficult by indefinite and missing chronicles, the uncertainty of dates and the fact that certain towns reached their final status by stages. The maps, though interim works, are reproduced on far too small a scale, and too indistinctly to be of any use. Professor Kuhn's article on planning during German settlement eastwards covers well-known ground from early medieval till modern times, but brings out clearly the fashions in settlement style at all dates—fashions set by custom at one time and by doctrine at another. The references to the colonial specialist (the Locator) of the Middle Ages working on a stereotyped model and of the textbook of settlement in the rationalistic eighteenth century are of interest. Again the maps and plans, though interesting, are hard to read.

In Volume II two articles by Professor Kirsten on the ordered use of territory by the Greeks and Romans give weight to this set of studies. These articles are particularly well-documented and comparative maps of Mediterranean vegetation and Greek urban development are illuminating. Early Greek settlements were hardly found in areas where the vine and olive will not grow. At an early stage Greek travellers appear as adventurers, but later they settled areas similar to their homeland, near the coast and so linked by sea with their home. Later they favoured defensible sites of a "factory" type, but nearly always where there was a secure agricultural basis. The Greek

city had its own territory and so had the Roman city. Such cities with their agricultural area became in due course Christian dioceses. The Romans were great delimitators of territories and administrative divisions and precisely surveyed their agricultural boundaries. As with the Greeks their cities were dependent on local agriculture, but Roman latifundia are, in a way, an alternative to such a city. Kirsten especially refers to various types of Roman colonies and to veteran settlement. Settlement patterns can now be verified by aerial photography of ground patterns. In these studies Kirsten's work is well tied into fundamental geography. The other studies here published seem rather artificial by comparison.

D. J. DAVIS

THE CLASSICAL TRADITION OF GEOGRAPHY. By DR. C. VAN PAASSEN. *Groningen: J. B. Wolters*, 1957. 9½×6 *inches;* xii+414 *pages.* 22.50 *guilders*

This book, financed by the Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek, has been translated into English by Mrs. C. Reith-Aerssens (Chapters I-IV, except III F and G), B. J. Wevers (V-VII) and R. R. Symonds, who did III F and G and revised the whole. There is an *Index locorum* by Miss Thea Westendorp, but no other index. Where passages from classical authors appear in English, the translations used are those of contributors to the Loeb Classical Library. As will be understood, the author's theme does not demand maps, plans, and the like, and the book has none of these. Full references are given to the original sources, partly in the text, partly in notes at the end, where also are found the references to the works of modern scholars.

Dr. Van Paassen has produced a work of wide and sound knowledge and of painstaking and accurate scholarship; a work which will be used by English readers with profit and pleasure. The author's object is to indicate the classical Greek tradition of geography, and to bring under this expression not so much mathematical, cartographical, or other descriptions of the known world of ancient Greek days, but rather a literary form or *genre* with consistent and lasting characteristics of its own, a visible aim, and its own position in Greek science; and to indicate what "status" and what character each Greek writer gave to geography within the wider project or framework of his writing.

Dr. Van Paassen has succeeded in his task; but to my mind there is a certain strangeness in the order in which the subject is presented, and I feel that, if there is indeed a defect in this book, it is the lack of an orderly unfolding of its theme. At times the author goes backwards on purpose, not forwards, so that the book, good though it is, will be best read, or at least best re-read, in large sections rather than in whole.

For consider: the first chapter, entitled "The heritage of Classical Greek geography: Ptolemy and Strabo," deals with not the earliest Greek geographers but the culmination of Greek geography in Strabo of Augustus's time and later in the geographical work of Ptolemy during the second century after Christ; and Dr. Van Paassen approaches Ptolemy first (pp. 1–2), then Strabo (pp. 3–32). Next, in the process of working backwards, we have, in the second chapter, traditions underlying Strabo's work, namely "The 'geographical' tradition: Eratosthenes and his predecessors." First there comes (pp. 33–54) Eratosthenes himself, who wrote in the later half of the third century before Christ, Dicaearchus, Eudoxus of Cnidus of the fourth century, Anaximander of the sixth, and Hecataeus's geographical work of the end of the same century.

Here Van Paassen reaches the main body of his work, the chapters on the "historical" tradition, and the heart of it in Chapter III (pp. 65–211) "The 'historical' tradition: Hecataeus and Herodotus." Here Hecataeus again appears, rightly (pp. 63–70), and rightly before Herodotus (pp. 71–211). This natural forward process is continued with Thucydides in Chapter IV "The 'historical' tradition: national history and national geography" (pp. 212–45); but, after a treatment of Thucydides of the later half of the fifth century before Christ, the author harks not indeed irrelevantly but none the less backward to Pherecydes, Xanthus of Lydia, who wrote perhaps even before Herodo-

tus, Charon of Lampsacus, and, above all, Hellanicus, the latter two being younger contemporaries of Herodotus. In Chapter V, "Ephorus and regional 'history' in the third century" (pp. 246–88), we go ahead with Ephorus, Theopompus, and Timaeus; then with writers of the age of Alexander (and of his immediate successors), beginning with Nearchus and ending with Megasthenes. Note that these writers are dealt with under a sub-title misleading for us—"Alexandrian geography," which means here geography not of Alexandria but of Alexander's times.

The whole of Chapter VI (pp. 289–315), except the parts which deal with Artemidorus and Agatharchides, is devoted to Polybius. Chapter VII, the last in the book, contains an interesting treatment of the general scholar Posidonius; and its form might, I feel, well have been applied by Van Paassen to the whole volume; Posidonius's antecedents in what includes a kind of physical geography—the investigations and works of Hippocrates, Aristotle, and Pytheas—come before the survey of Posidonius himself. Van Paassen almost ends his work by noting that "Strabo was able to build upon the work of both" Polybius and Posidonius. Just so; but it is in Chapter I that Strabo is dealt with. Our author may have had good reasons of his own for the shape which he has given to his book, which, from my point of view, does not begin at the beginning, and seems to have no real ending. In any case his scholarship is good and his judgements are sound, or reasonable when certainty cannot be got.

The translation of the author's Dutch has some unimportant examples of slightly unusual English, and misprints are few. On page xi, line six of the Introduction, "het" for "the" is a neat anagram which stands alone; omission of seven words after the third line of page 48 has been noted on an *erratum*-slip. Note also the following: page 26 *προνοία* should be *πρόνοια* (Ionic *προνοίη*); page 153 *ἱδρύματα τε* should be *ἱδρύματά τε*. Bias in line 10 on page 282 should really be Beas; page 375 in note 30 *πρώτοι* should be *πρῶτοι*. Page 393 note 24 Institute should be Institutes; page 396, note 2 Scholl's should be Schoff's; page 398 note 23 millers should be milkers. Readers may be puzzled by "Ritterian remark" on page 15; Ptolemy Lagu on page 370 may look strange but has no error; and "fantasist" on page 332 should cause no trouble. Perhaps the only really startling thing is on page 359, note 12 "Pliny the elder, an accurate compilator . . . ," even if Van Paassen means simply that Pliny usually indicates the source of his statements.

We look forward to further studies in or round the field of geography from Dr. Van Paassen.

E. H. WARMINGTON

CARTOGRAPHY

TIMES ATLAS OF THE WORLD: Vol. 1. Edited by JOHN BARTHOLOMEW. *London: Times Publishing Co.*, 1958. 19½ × 12½ *inches; 24 plates; 34 page index.* 105*s*

The twenty-four full-size plates in this volume, the fourth in order of publication, include seventeen maps covering Far East, Antarctica and Australasia, and seven World Maps devoted to special themes. The maps are generally of the high quality we have come to expect in this publication. The system of layer colouring through shades of green, brown, to grey for the very high levels, is unobtrusive. A simple, non-serif style of type appears on some of the plates and is very satisfactory. Plate 9, The Orient, shows an interesting application of the Transverse Mercator projection, but the hill-shading used here is rather ugly. Reflecting the recent progress in exploration and mapping, two full plates are devoted to Antarctica and to New Guinea.

The seven World Maps depict physiography (vulcanology, geology, seismology), oceanography (bathymetry, salinity, fauna, temperatures), climatology (precipitation, air movements, storms), vegetation (natural vegetation, temperatures, land use), mankind (population, races, languages, religions), surface routes, and air routes.

In a short illustrated article, Maj. Gen. R. Ll. Brown reviews development and progress in surveying methods and the topographical mapping of the world.

Special projections are used for some of the World Maps. The Regional projection of Plate 1 and the Lotus projection of Plate 2 have central portions on a conical

system and three lobes or petals which appear to be of Bonne construction. The lobes are placed, in one case radiating from the North Pole to contain the three south-pointing land systems of South America, Africa and Australasia; in the other case radiating from the South Pole to cover the ocean areas Atlantic, Pacific, and Indian.

It is unfortunate that some confusing terminology appears on these plates. The *regional* projection is described as *conformal and near equal-area*. The term *conformal* has a quite precise meaning in the theory of surfaces and map projections, just as the term *equal-area* has, and these two properties are incompatible. Perhaps the conical portions of the regional and lotus constructions are conformal; the lobe portions are obviously not conformal and may indeed be equal-area. The use of the expression "knots per hour" is deplorable.

Three of the World Maps are on Winkel's Tripel projection, which at first glance looks like an Aitoff (or Hammer) construction. Actually, the projection has the property that the Poles are represented by lines of finite length but much shorter than the Equator, so there is some relief from the absurd stretching effect seen on truly cylindrical projections in high latitudes.

This volume has a single-page frontispiece World Map of elliptical shape showing the principal political and strategic groupings. It is drawn on the Atlantis projection, an interesting application of the Mollweide, and described as *a transverse oblique homolographic equal-area arrangement*. The meaning of *oblique* in map-projection theory has no settled exact definition, but it could be defined so as not to be incompatible with *transverse*. According to the Oxford English Dictionary, *homolographic* means *corresponding point by point*, a property possessed by almost all map projections.

J. E. JACKSON

GAMBIA LAND USE 1:25,000. Sheet 14/11, Mansa Konko. 36×26 *inches. Published by the Directorate of Overseas Surveys*, 1958. *Copies obtainable from Edward Stanford Ltd.*, 12/14 *Long Acre, London, W.C.*2.

SINGAPORE LAND USE MAP 1:6336. Sheet 5/49. 15½×20 *inches. Published by the Singapore Improvement Trust*, 1958

It is a pleasure to welcome two new land use surveys within the British Commonwealth. The most striking feature of both is their generous scale. The Gambia's choice of 2½ inches, and Singapore's of no less than 10 inches to the mile, reflects the purpose of each map as a practical instrument rather than as an academic probe. Both countries face definite development problems and both have realized the need for a sound factual knowledge of present land use distributions as a basis for planning future policy.

The Gambia's chief problem at present concerns rice. The population has outgrown its traditional bush fallowing system. Pressure on the land has shortened the land rotation period, and new crops are sown before the leached soils can recover from the previous cultivation. To tide over the resultant hunger season, rice had to be imported, and as a longer-term measure rice cultivation was encouraged along the flood plain of the Gambia River. The hungry season has been eliminated but the problem is not solved, because rice imports continue to increase. The suspicion arises that lowland rice is proving, not a supplement, but a replacement of the traditional upland rice. Statistics do not illuminate the problem. Each administrative unit includes both upland and riverine land, and figures alone do not reveal any locational shift within the unit. For this a distribution map is essential. The Gambia map is definitely rice-oriented. No less than ten of its sixteen land use categories are directly or indirectly related to rice. The mangrove swamp fronting the Gambia River is classified as either high mangrove, where soils would be suitable for rice growing, or low mangrove where it would not. Grass marsh, barren marsh, reeds and standing water are also significantly precise subdivisions, although their specific rice producing potentialities are not mentioned. Areas of current rice cultivation are distinguished according to whether the crop occupies over 90 per cent., 30 to 90 per cent., or less than 30 per cent. of the

ground. Complementary utilization in these areas is neglected. Finally, the picture derived from aerial photographs of 1956 is supplemented by lines enclosing rice areas appearing on 1946 photographs. This time dimension is new for land use maps and is a valuable illumination of the trends under investigation.

The colours used are clear and bright. Each category can be picked out immediately. However, it seems that the available colour range could have been better disposed. For example, the use of green for forest and brown for bush fallow, instead of vice versa, would have been more in keeping with the colour system agreed by the Old World Division of the World Land Use Survey. Despite this, and despite a reticence about the scale of the photographs consulted, the Overseas Survey deserves congratulation for the conception and execution of an excellent tool for practical use.

In Singapore, with a population density of over 4000 people per square mile, the land use problem is at once more general and more acute. Thus there is no specific emphasis, but a balanced and detailed representation of 43 categories of land use. The colours employed are pleasant and aesthetically muted, without sacrifice of legibility. Nine colours are used in combination with appropriate, if somewhat crudely printed, conventional signs. This bestows the advantage that both major classes and their subdivisions can be used as a unit at will. Thus arable land as a whole can be distinguished at a glance as the Old World Division's conventional brown, but 10 divisions within it, such as pineapples, pepper or kampong horticulture can also be picked out easily by focussing attention upon the symbols.

Every area has its specific land use characteristics which may demand modifications in the Old World Division's broadly based scheme, but such changes should not be made lightly. One pitfall is the temptation to use for special local purposes a colour which would be locally absent according to the Old World system. For example, the Singapore map, having no call for the light green of pasture, adapts it for tree crops instead of using the conventional light purple, which would have been perfectly possible since both the requisite primary colours are already in use. A second criticism, not of this survey alone, is the equation of productiveness with agriculture, which here results in the illogical inclusion of industry, quarries and gasworks in the category of unproductive land. It would seem better to class them with "settlements and associated non-agricultural land." However, it is only in the context of the Old World Division's scheme that the Singapore map justifies criticism. In itself it is an excellent production based on field-work by the University of Malaya geographers, and therefore presumably of the highest accuracy. It is easy to read and handle and the complete edition of 94 sheets should be of great practical and academic value.

ALICE COLEMAN

GENERAL

THE MOUNTAIN WORLD, 1958/9. English version, edited by MALCOLM BARNES. *London: Allen and Unwin, for the Swiss Foundation for Alpine Research*, 1958. 10×7½ *inches;* 208 *pages; maps and plates.* 25*s*

Political difficulties and formidable budgeting continue to turn climbing parties from the Himalaya to cheaper, smaller, but not less rewarding ventures in other continents. The Austrians had 238 porters on Gasherbrum; a truck usually suffices in the more accessible Andes. The 1958/9 issue of 'The mountain world' reflects strikingly the spread of expeditions over the past year or two, and does so in accordance with its established pattern of new information, lucidly presented in essays, and illuminated with photographs of extraordinary beauty. This volume takes the reader to the mists of the Mexican volcanoes with René Dittert and his French friends, to the Baltoro giants with the Austrians, with British parties to Huagaruncho and Machapuchare, with Gunter Hauser's Federal German group on a mopping-up operation in the Cordilleras Blanca and Vilcanota; in the same period, Argentinians were on Dhaulagiri (with dynamite for recalcitrant places) and the Japanese climbed Manaslu (no dynamite, but slow-burning body-warmers). Only the North Americans, in fact, play at

home, with new routes on Logan and Rainier. The narratives are, without exception, well done, but the writing is at its best in three accounts where tragedy supervenes. Dittert offers a trenchant criticism of the unsuccessful helicopter rescue operations on Mont Blanc; there is a moving account of the death of Hermann Buhl on Chogolisa, which might have been prefaced with the penultimate warning Whymper wrote in the 'Scrambles,' and a stern yet compassionate study of the Eiger martyrology, with folding plates of the cemetery, by editor Gurtner. The cases of Buhl and the Eiger victims seem to point to the same moral, namely, that great talent and experience provide no immunity unless they are constantly and consciously utilized. The talented pay the same price if they commit the errors of the novices, or have no place for discretion among their equipment. In a book as good as this, the little flaws irritate more than they otherwise would. Klier's story of the ascent of Jirishanca badly needs a map; the caption of Plate 17 is surely wrong; spellings like "trunkated" and "muletiers" (pp. 58, 61) are a little eccentric. ALLAN CUNNINGHAM

SHORTER NOTICES

BARCELONA WITH LOVE (*Allen and Unwin*, 1959, 18*s*) describes that part of the city known as the Ramblas where Clifford King has lived for a long time and where he is very much at home. His description follows the pattern of a documentary film, a series of scenes, characters and conversations loosely strung round the 24 hours of the author's day. He delights in the vitality expressed in the bars, cafês and popular theatres of which the narrow streets are full, and in the women, and to a lesser extent the men, who inhabit them. His is a jealous love, for he resents alike the incomprehension which foreigners show towards Spanish qualities and the arbitrary acts of authorities out of touch with the people. He disapproves particularly of organized religion which he sees as inimical to all that for him constitutes the good life.

When he speaks of Spanish acceptance of pleasure, pain and poverty he is sometimes illuminating. Some of the singers and dancers too live as human beings, and he renders well those scenes, like the Sardana dance or the Catalan choirs, which illustrate local patriotism. But we are taken to too many bars and music-halls, conversation and commentary both become wearisome, and like some other documentaries of the kind this one does not leave a great deal behind. E. G. H.

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THE SELECTIVE TRAVELLER IN PORTUGAL (*Chatto and Windus*, 1958, 21*s*) was first published in 1949 and is now reissued after a thorough revision. It remains an attractive and readable guidebook because it is the result of original investigation and because the authors (Ann Bridge and Susan Lowndes) write of what they have seen with both authority and affection. There is abundant information about Portuguese history—a knowledge of which is necessary for the intelligent visitor—and about the glories of the architecture. The authors are rightly insistent about the architectural wealth. This is especially true of the two great periods, the sixteenth century Manueline and the eighteenth century Baroque; the former exemplified by Batalha and the Jeronimos and the latter by homes, palaces, churches and convents all over the country.

It is indeed a pity, as the authors remark more than once, that this priceless heritage should be endangered by the ruthlessness of official attempts at restoration of many castles and churches. Let us hope that more regard will soon be given to the dictates of Portuguese taste and scholarship.

The authors enter fully into the life of an agricultural and a pious people and there is much about farming methods, festivals, processions and pilgrimages. Practical information is given about the quality of the hotels and there is a section on Madeira and the Azores. E. G. H.

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In JOURNEY THROUGH CORNWALL (*Methuen*, 25*s*) Louis T. Stanley is an adventurous, discriminating and fair-minded guide to the county's rich individuality. He gives a lively picture of every town and village he visits. Cornish history is illustrated by such figures as the Irish saints, the Grenvilles, Margaret Godolphin, John Wesley and Richard Trevithick. There are the traditional customs and sports. There is much about castles, the Celtic remains and the astonishing churches. Above all there are the magnificent stories—often of ghosts, piskies, mermaids and devils. Many of the best of them tell of the sea which gives Cornwall so much of its character and are worthily interwoven with descriptions of the wild rocky scenery.

Altogether a delightful book, a veritable anthology of folklore drawn in part from the chronicles of the past (which are plentifully quoted) and in part from the conversations and experiences that result from the author's enterprise. "The past is kept very fresh in Cornish inns." E. G. H.

* * *

William Travis gave up a steady flying career to look for Green Snail shell on the remoter reefs of the Indian Ocean. BEYOND THE REEFS (*Allen and Unwin*, 1959, 21*s*) is very much off the beaten track; Mr. Travis based himself on Mahé Island in the Seychelles, where he recruited and trained a team of divers whose personalities come very much alive in the course of an interesting, and modestly told, story of adventure. The pictures, both coloured and black and white, are of the high standard we have come to expect in "underwater" books. D. M.

* * *

Alan Villiers's experiences at sea have been many and various, and GIVE ME A SHIP TO SAIL (*Hodder and Stoughton*, 1958, 18*s*) recounts some of the more recent, and odder, of his adventures. Sailing an unseaworthy reconstruction of the *Pequod* in the Irish Sea during an attempt to film "Moby Dick," and taking the *Mayflower* to America are the highspots of this most entertaining book, which contains, in addition, a serious plea for the establishment in this country of a school-ship for training boys in the ways of the sea. D. M.

* * *

The climbing of Pumasillo (20,490 feet) by the Cambridge Andean Expedition, 1957, must rank as one of the major mountaineering feats in the Andes in that year. Before the mountain could be climbed, however, it had in a sense to be found, for there were only poor maps, very little information and a few photographs to guide the seven young men who set out to explore the approaches to this giant of the Vilcabamba area, north of Cuzco. That they were successful is a tribute to their careful planning and organization as well as to their initiative and skill. THE PUMA'S CLAW (*Hutchinson*, 1959, 21*s*), Simon Clark's personal account of the expedition and of the problems encountered and overcome, is light-hearted, perceptive, vivid and gripping. The reader participates in the day-to-day problems, the humour, trivialities and the discomforts of the expedition. Clark succeeds, too, in evoking the landscapes and the character of the Peruvian Andes. The photographs are excellent and well chosen. C. T. S.

THE SOCIETY'S NEWS

MEDALS AND AWARDS

Her Majesty The Queen has been pleased to approve the award of the Royal Medals as follows: The *Patron's Medal* to Commander W. R. Anderson, U.S.N., for the first trans-polar submarine voyage, in command of U.S.S. *Nautilus*; and the *Founder's Medal* to Sir Raymond Priestley, United Kingdom observer, U.S. Antarctic Expedition 1958–9, for services to Antarctic exploration.

The Council of the Society also announces the following awards: *Victoria Medal* to Mr. Gerald Seligman, President of the British Glaciological Society, for contributions to glaciological research; the *Murchison Grant* to Professor S. P. Chatterjee, professor of geography, Calcutta University, and director, "National Atlas for India"; the *Back Grant* to Mr. David Stratton, deputy leader, Commonwealth Trans-Antarctic Expedition; the *Cuthbert Peek Grant* to Mr. George Lowe for contributions to Himalayan and Antarctic exploration; the *Gill Memorial to* Mr. G. S. Holland, chief draughtsman, Royal Geographical Society, for contributions to cartography, especially of southern Arabia; the *Mrs. Patrick Ness Award* jointly to Mr. J. H. Miller, deputy leader, New Zealand party, Commonwealth Trans-Antarctic Expedition, and to Dr. George W. Marsh, also of the Commonwealth Trans-Antarctic Expedition and of the Falkland Islands Dependencies Survey.

GRANTS TO EXPEDITIONS 1959

The Council has approved grants totalling £900 (including £45 from the Stephens Bequest, £100 from the Penruddocke Bequest and £150 from the Latin-American Travel Fund) to nine expeditions in 1959, and eleven other expeditions have been approved; instruments have been lent to fifteen out of this total of twenty expeditions. Details (to April 1959) are as follows:

Financial aid: Gornergletscher Glaciological Survey (£150 plus instruments); Cambridge University Expedition to Brazil (£150 from Latin-America Travel Fund); Cambridge Expedition to Cyrenaica (£100 from Penruddocke Bequest); Cambridge Colombian Expedition (£100 plus instruments); Durham University Crete Expedition (£50); Cambridge Expedition to British Honduras (£150 plus instruments); Second Oxford University Tanganyika Expedition (£55 plus £45 from Stephens Bequest, plus instruments); Imperial College Jan Mayen Expedition (£50 plus instruments); Glasgow University Visdal (Norway) Survey (£50).

Approval and instruments: Imperial College Azores Expedition; Oxford University Expedition to British Guiana; Cambridge Nicobar Islands Expedition; Leicester University Expedition to Norway; British Museum Expedition to Peru; Imperial College Apolobamba Expedition; Batura Mustagh Expedition; Islay Archaeological Survey Group; Oxford Expedition to Northern Rhodesia; Cambridge Expedition to South-West Serbia.

Approval only: Cambridge Annobon Island Expedition.

Of the above expeditions, the following have also received ciné cameras and equipment purchased out of a generous grant from the Calouste Gulbenkian Foundation, Lisbon: Imperial College Azores Expedition; Oxford University Expedition to British Guiana; Cambridge Nicobar Islands Expedition; Cambridge Expedition to British Honduras; Batura Mustagh Expedition.

In addition to the above, substantial grants in aid were made to expeditions in mountain regions by the Mount Everest Foundation, constituted by the Society and the Alpine Club; and a grant of £35 was awarded by the *Geographical Magazine* Trustees to Sheppard S. Frere, reader in the archaeology of the Roman Provinces, London University, for a survey of Iron Age *oppida* in Corrège, France.

Left to right: The President, Lord Nathan, and Lady Mawson, and Sir Eric Harrison, High Commissioner for Australia, at the unveiling of the portrait of the late Sir Douglas Mawson, distinguished Australian scientist and Antarctic explorer

APPLICATIONS FOR GRANTS 1960

Applications for grants for both exploration and research for the year 1960 must reach the Director and Secretary not later than 27 *February* 1960; it is only in very exceptional circumstances that later applications can be considered. Applications must be *typed* on the Society's own form, which can be obtained on request; they must be accompanied by evidence of support from institutions or qualified individuals supporting the proposed expedition or research. Leaders of expeditions and other applicants for grants may be expected to attend an interviewing board.

Expedition leaders are asked, when dealing with the Press, not to use the Society's name in connection with their expedition until they have received official approval of the Council.

THE SOCIETY'S LIBRARY

The Library and Maps Committee has been considering the extent to which sections of the Library may require to be augmented to meet the needs of research workers in geography, teachers of geography, and students, who now form the majority of those using the Library. The Committee considers that it is mainly the holdings of official publications which should be extended, *e.g.* the general statistical surveys issued by bodies such as the United Nations Organization. It has also decided to obtain the complete county reports of the 1951 Census of England and Wales. For other sections of the Library the Committee would welcome, from Fellows with special knowledge, suggestions of works of importance to be added to the Library.

EVA G. R. TAYLOR LECTURE

To mark the occasion of the eightieth birthday of Professor Emeritus E. G. R. Taylor, D.SC., LL.D., on 22 June 1959 an appeal is being launched (signed by the President of the Society) for a fund of £1000 to endow an annual lecture in the branches of knowledge to which she has made, and is still making, distinguished contributions.

During the last thirty years Professor Taylor has become known to a wide public by her brilliant studies in the history of geographical ideas and discovery and of nautical science. Her academic distinction was recognized by the award of the Victoria Medal of the Royal Geographical Society in 1947. She is an honorary member of the Institute of Navigation, and a Vice-President of the Hakluyt Society.

We believe that there could be no more proper recognition of Professor Taylor's singular service to learning than the endowment of a lecture as a stimulus to scholarship in her fields. Contributions payable to the 'Eva G. R. Taylor Lecture Account' should be sent to the Honorary Treasurer, D. Chilton, Esq., The Science Museum, London S.W.7.

SIR DOUGLAS MAWSON

On April 13, before the Evening Meeting at 8.30 p.m., a portrait of Sir Douglas Mawson, painted by the well-known Australian artist, Mr. Ivor Hele, was presented to the Society by H.E. the High Commissioner for Australia on behalf of the Friends of Mawson and Fellows of the Society in Australia, who had made this generous gift. The presentation took place in the presence of Lady Mawson, and a short speech of thanks was made by the President on behalf of the Society. The portrait has been hung on the main staircase in the Society's House.

Left to right: The President, Lord Nathan, and Lady Mawson, and Sir Eric Harrison, High Commissioner for Australia, at the unveiling of the portrait of the late Sir Douglas Mawson, distinguished Australian scientist and Antarctic explorer

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE JOURNAL

Mrs. Spry is the wife of the Agent-General for Saskatchewan, and was formerly assistant professor of economics, University of Toronto. *H. T. Norris* is a lecturer in Arabic at the School of Oriental and African Studies. *Dr. R. D. Barnett* is keeper of the Department of Western Asiatic Antiquities at the British Museum. *Professor A. Leslie Banks* is professor of human ecology at the University of Cambridge. *Dr. George Barbour* is professor of geology at the University of Cincinnati; he was formerly on the staff of University College London, and has contributed to the *Journal* other papers on water-power projects in the New World. *Dr. G. H. Dury* is lecturer in geography at Birkbeck College, University of London. *Malcolm Mellor* was ANARE glaciologist from 1956 to 1959 and is now engaged on research at Melbourne University.

It is regretted that in the March *Journal* the name of *G. R. Batho*, lecturer in education, University of Sheffield, was omitted from the list of "Contributors."

UNIVERSITY NEWS

UNIVERSITY OF KHARTOUM

There is progress to be reported in the researches recorded two years ago.[1] Sayid Ahmed el-Sayid Osman, although now in the University Registry, is continuing his work on the irrigation economy of Northern Province as a part-time research fellow at Durham. L. Berry, M.Sc. (Bristol), senior lecturer in physical geography, who joined the department in December, 1957, is investigating and mapping land forms in the vicinity of Khartoum and along the White Nile. He is also studying the climatic factor entering into processes operating upon granitic areas and the resulting land forms.[2] H. R. J. Davies has continued his activity in Blue Nile Province, and has visited the Ingessana, Berta, Koma, Uduk, Mabaan and Hill Barun tribes, close to the Ethiopian border. He has also extended his work into Upper Nile Province, between Malakal and Nassir. Dr. Hassan Ibrahim Hassan has completed his London University thesis on "The waters of the Nile," and is preparing it for publication. Much of this summarizes studies and controversies attending the choice of sites for past and future control constructions.

Professor J. H. G. Lebon has continued his researches into land use. He has revised his provisional land use map on a scale of 1:3M,[3] and has also used trimetrogon air photographs to plot land use boundaries on the 1:1M El Fasher and Abeshr sheets. Other 1:1M sheets are in preparation, and a memoir on land use in the country. J. R. Randell is studying the influence of western culture and technology on African rural economies in the Gezira (between the Blue and White Niles). He is including the area near Managil now being developed as a large-scale irrigation project. The department of geography has also mapped population statistics produced by the 1955 Census. Maps compiled by Mr. and Mrs. Davies are included in "The Population of Sudan,"[4] and by K. M. Barbour (now of University College, London) in "21 Facts about the Sudanese."[5]

J. H. G. LEBON

[1] *Geog. J.*, **122** (1956), p. 520.
[2] *Geol. Mag.* **94** (1957), pp. 249–60.
[3] *Economic Geography*, **59** (1959), pp. 60–70.
[4] Philosophical Society of Sudan (Report of Sixth Annual Conference), Khartoum, 1958.
[5] Department of Statistics, Khartoum, 1958.

UNIVERSITY OF HONG KONG

A report for the year 1957–8 has been received in the Library from the department of geography and geology in the University of Hong Kong. There were new appointments to the staff during the year. Mr. John Rose of the Colonial Education Service, Singapore, accepted the vacant post of lecturer; Mr. So Chak Lam was appointed assistant lecturer in place of Mr. L. Berry who left to take up an appointment at Khartoum; Mr. Chiu Tze Nang, a graduate of Hong Kong University, joined as a part-time lecturer.

Professor S. G. Davis attended the 9th Pacific Science Congress in Bangkok in November 1957, where he read a paper entitled "Tungsten mineralization in Hong Kong and the New Territories," and in July 1958 he visited Taiwan. The map library and museum of the University continue to grow, and a large-scale (1:20,000) bas relief model of Hong Kong and the New Territories has been completed under the supervision of Mr. Cheung, to show the solid geology.

The Report lists a number of publications by Professor Davis and by Dr. T. R. Treagear, whose 'Land use in Hong Kong' was reviewed in the *Journal* for March 1959.

INSTITUTE OF BRITISH GEOGRAPHERS: CONFERENCE AT CAMBRIDGE

After an interval of nine years, the Institute of British Geographers returned to Cambridge for its annual conference, which was held from 2 to 6 January 1959 in the department of geography, Downing Place. Since its previous meeting at Cambridge in 1950 the membership of the Institute has more than doubled, and the provision of residential accommodation for the large number of members who now attend the annual conference presents formidable problems. Nevertheless, although the attendance established a new record of 260 (as compared with 160 in 1950), St. John's and St. Catharine's Colleges were able to provide the accommodation required.

On the evening of January 3 members were the guests of the staff of the Cambridge department of geography at a reception in Downing Place, and a larger company than members of the College could recall gathered later in St. John's Hall for the Annual Dinner of the Institute. Among the guests, Council and members were delighted to welcome the Master of St. John's College and Lady Wordie, and on the eve of Sir James Wordie's retirement the occasion provided a happy opportunity for academic geographers to acknowledge the goodwill and kindness so constantly shown to them by one who is himself a distinguished former President of the Royal Geographical Society.

The Conference opened on the Friday evening with the Presidential Address. Adopting the novel title, "Le pays de Galles," Professor E. G. Bowen developed his thesis of the essential Wales, thriving districts which are the seats of a truly lively Welsh culture. They were shown to lie west of the highland core, where the traditional economy is in decay and the population is dwindling. More provision than in the past was made for discussion of topics of wide or general interest, and there were valuable exchanges of views on the University teaching of regional geography, the field mapping of human features, political geography, climatology in the context of geography, and the origin of the river system of central Britain. Interposed between the full programme of research papers and discussions that occupied Saturday and Monday, Sunday was devoted to whole-day excursions. Members were offered the choice of a wide range of itineraries and aspects of geography under the expert leadership of colleagues in the local department of geography, assisted by Dr. Perrin and Mr. Brookes of the School of Agriculture.

At the Annual General Meeting, the officers were able to report the publication, in spring 1958, of a monograph on Southern Chile by Dr. G. J. Butland, and in December another compendious volume of Transactions, containing the 1958 Presidential Address by Professor R. H. Kinvig and fifteen other research papers. Professor

K. C. Edwards was elected Vice-President, and will therefore succeed Professor W. G. East as President in 1960, after the meeting of the Conference which will be held in the University of Southampton from 1 to 5 January 1960.

A. E. SMAILES, *Honorary Secretary*

MOUNTAIN GLACIATION

The attention of geographers is drawn to an important report issued by the American Geographical Society—"Geographic study of mountain glaciation in the Northern Hemisphere," in nine volumes and an atlas. It has been compiled by the Society's Department of Exploration and Field Research for the Environmental Protection Research Division, U.S. Army. The Report is a summary of published material, with some unpublished data based on observations made by members of the Department, from a great number of sources available in 1956. The study is stated to be primarily concerned with "the location, distribution, characteristics, behaviour and significance of existing mountain glaciers." A general review, including a discussion of classification and terminology, is followed by the regional parts, and two concluding parts deal with "Environment and cartography" and "Glaciers and human activities." The regional parts are: Alaska and adjoining parts of Canada; western Canada and Arctic Canada; United States, Mexico and northern Andes; North Atlantic Islands; Europe and Africa; western Arctic and eastern Asia; and the Central Asian mountain system. Each chapter is followed by extensive bibliographical references. The atlas, drawn by the cartographic staff of the American Geographical Society and printed by the Quartermaster Corps, shows clearly the location of mountain glaciers, differentiating between large known glaciers and small, not reliably mapped glaciers. The distribution of the complete report is limited; copies have also been presented to the British Glaciological Society and the Scott Polar Research Institute. Indexes to the regional parts are to be issued later. Notification of omissions and errors, and new sources of information would be welcomed by the American Geographical Society.

NEW ZEALAND GEOGRAPHICAL SOCIETY

The Second Triennial Conference of the New Zealand Geographical Society was held at Canterbury from 25 to 30 August 1958, with Professor G. Jobberns in the Chair. The *Proceedings* have recently been received in the Society's library, and contain most of the papers read at the Conference; it is expected that the others will be published in forthcoming issues of the *New Zealand Geographer*. The conference was organized by the Canterbury branch of the N.Z.G.S. with Mr. J. L. Hewland as chairman, and Mr. L. S. Suggate (sometime member of the Council of the R.G.S.) as general secretary.

ITALIAN GEOGRAPHICAL CONGRESS

The Library has received from the publishers the report of the seventeenth Italian Geographical Congress, held at Bari in April 1957 ('Atti del XVII Congresso Geografico Italiano,' 4 vols., Bari: Editore Cressati, 1957). As is usual, the addresses and communications are devoted first to the problems concerning the region in which the Congress is held and secondly to the geography of Italy in general. Thus there are numerous papers on the land reforms and the recent changes in the cultural landscape consequent upon reclamation measures in southern Italy, in addition to those on climatology, karst studies, human geography and tourism in Italy, with special reference to the south. Exhibitions, including past and present cartography and photographs of the region, were also mounted. The volumes therefore provide much material on the geography of southern Italy, and, with the triennial summaries of the geographical work of the Consiglio Nazionale delle Ricerche and other institutions, an indication of the work in which Italian geographers are now engaged.

FIFTH CENTENARY OF THE DEATH OF PRINCE HENRY THE NAVIGATOR

The Portuguese Government, to mark the fifth centenary of the death of Prince Henry the Navigator, is organizing an "International Congress of the History of the Discoveries" in Lisbon from 4 to 12 September 1960. The two main sections will deal with "History of the discoveries" and "Overseas expansion." Details may be obtained from the Secretário-Geral, Congresso Internacional de História dos Descobrimentos, Palácio de S. Bento, Lisboa. The Commission has also undertaken the publication of "Portugaliae monumenta cartographica" as part of the Commemoration. This monumental work in five volumes will contain over seven hundred plates of examples of Portuguese cartography, some in colour. The accompanying text will be in Portuguese and English. Copies of the work, planned and edited by Dr. Armando Cortesão and Commander A. Teixeira de Mota, will be made available to the principal libraries and other institutions of the world. Further, a "Grande premio Infante D. Henrique" is being offered for the best book on Prince Henry, the man and his achievements, published between December 1958 and 30 June 1960 in one of the six official languages of the Congress. There will be a first prize of 100,000 escudos, and a second of 30,000 escudos. The regulations for the award may be obtained from the Secretário-Geral at the address above. G. R. CRONE

THE FAUNA PRESERVATION SOCIETY

Man is at last beginning to realize that he is part of nature, and a new ecological approach to wild life problems has given rise to a world movement for nature conservation and to the establishment of the International Union for the Conservation of Nature and Natural Resources, with headquarters at Brussels. In Great Britain the Fauna Preservation Society, under the presidency of the Marquess of Willingdon, has for many years helped to promote a wider interest in the urgent need for the preservation of wild life and cooperates with similar organizations in other countries. Its journal, *Oryx*, is published six times a year and the first part of volume 5, published in April, contains articles on the Kariba Lake, by H. N. Smithers and on Kenya Colony by F. Fraser Darling; to mention only two which will be of interest to geographers as well as naturalists. Full particulars of the Society and its objects may be obtained from the Secretary, Lt. Col. C. L. Boyle, c/o the Zoological Society of London, Regent's Park, N.W.1. E. HINDLE

IZVESTIA OF THE ALL-UNION GEOGRAPHICAL SOCIETY

The January–February 1959 issue of the *Izvestia* (Bulletin) contains an article describing the history, structure and activities of the Royal Geographical Society. This article, by Mr. L. P. Kirwan, was written at the invitation of Russian geographers and has been translated into Russian by Professor S. B. Kalesnik. It is a mark of the closer scientific contacts which it is hoped can be maintained between the two societies and between British and Russian geographers.

NOTES

Two reprints from the NEW ZEALAND JOURNAL OF GEOLOGY AND GEOPHYSICS have been received in the Library, one entitled "A radiocarbon date for penguin colonization of Cape Hallett, Antarctica" (Vol. 1, No. 3, 1958), by H. J. Harrington and I. C. McKellar, and the other "Beaufort Island, remnant of a Quaternary volcano in the Ross Sea, Antarctica" (Vol. 1, No. 4, 1958). Both authors are members of the New Zealand Geological Survey, Department of Scientific and Industrial Research, Wellington. In the first article, it is concluded that penguin colonization of shoreline breeding sites must have occurred since the maxima of ice advances in the last glaciation, 10,000 to 30,000 years ago. The age of a frozen Adélie penguin body from the base of an accumulation of bodies and guano at the Cape Hallet rookery has been determined by radiocarbon method as 1210 ± 70 years. The second extract suggests that Beaufort Island, near the entrance to McMurdo Sound, is a remnant of a basaltic cone of about last interglacial age.

* * *

A pamphlet on New Zealand's "vital need for greater population" has been published recently by "THE DOMINION SETTLEMENT POPULATION ASSOCIATION (Inc.), P.O. Box 783, Wellington, N.Z. It is written by A. Leigh Hunt and is called 'The sands of time are running out.' Mr. Hunt advocates a much larger intake of assisted emigrants, and less restriction on their age, sex, and size of their families.

* * *

The firm of EDUCATIONAL PRODUCTIONS LTD., in collaboration with the Australian Government and J. Lyons and Co., have launched an interesting project. Schoolchildren between the ages of 11 and 16 are invited to submit, through their teachers, essays for which the first prize will be a visit to Australia. Essays must be submitted by 1 October 1959, and all particulars, and also "Teaching Kit," may be obtained from Educational Productions Ltd., East Ardsley, Wakefield, Yorkshire.

* * *

The Luso-Brazilian Council announces conditions for the CAMOENS AWARDS 1959. The sum of £50 is offered for essays on some aspect of the life and work of Prince Henry the Navigator; they should be written in English and give evidence of substantial study. Full particulars of this competition may be obtained from the Luso-Brazilian Council, Canning House, 2, Belgrave Square, S.W.1 and the closing date is 31 December 1959.

* * *

The third issue of the annual 'Statistical abstract of Latin America,' for the year 1957, has been received from the COMMITTEE ON LATIN AMERICAN STUDIES, University of California, Los Angeles. In these statistical tables, the independent states of Latin America are shown in three regional groups—Central American, Antillean and South American—and dependencies are grouped by political affiliations. In addition statistics are given for the United States and Mexico, and in some cases world totals also. It is thus possible to make some comparisons between Latin America and the rest of the world. The tables are comprehensive; public finance, investments, national incomes and similar topics are covered as well as land use, population, production, consumption, transportation and foreign trade. Single copies of the Abstract are obtainable at $2.00.

* * *

The Canterbury Branch of the NEW ZEALAND GEOGRAPHICAL SOCIETY has published 'Maps of Canterbury and the West Coast; a selected bibliography,' Christ-

church, 1958. The majority of the maps listed are in the offices of the Department of Lands and Survey in Christchurch and other centres, and few have been published in books or journals. 'West coast' is interpreted in a geographical sense. The two main sections are Canterbury maps and West Coast maps, the general maps being followed by towns and settlements and then rural areas. The earliest is a chart from the second voyage of Dumont D'Urville, 1840. For the history of the settlement and opening-up of Canterbury these maps and plans are documents of much importance.

* * *

The Library has received the first volume of a general catalogue of maps, plans and drawings in the ARCHIVES DE FRANCE, PALAIS SOUBISE, PARIS. It covers that portion of a collection of plans on a scale greater than 1/20,000 and other graphic material such as perspective drawings and architectural elevations, which relate to the Department of the Seine, including Paris and its environs, and mostly earlier than the nineteenth century. The arrangement is topographical and then chronological: general plans of Paris, then plans of 'arrondissements' and 'quartiers,' followed by plans of communes, arranged alphabetically. Many date from the sixteenth century, and they show in great detail the development of the capital. Geographers and historians interested in Paris, historians of architecture and indeed of social life in general, should find this volume of considerable value. It has been compiled by Monique Hébert and Jacques Thirion, and has a preface by the Director, Charles Brabant.

* * *

The DEPARTMENT OF GEOGRAPHY, NOTTINGHAM UNIVERSITY, is issuing a "Bulletin of material on the geography of the U.S.S.R.," of which number 5 is dated February 1959. The general purpose is to meet the need for statistical material on the geography of the U.S.S.R., based upon Russian sources. Each issue deals with a particular topic: among those already treated are the new economic regions of the U.S.S.R., industrial and population statistics, compiled by Mr. J. P. Cole, transport statistics by Mr. R. E. H. Mellor, and agricultural statistics by Mr. C. A. Halstead. The Bulletin, in processed typescript, can be obtained for a small charge from the Department.

* * *

OBITUARY

AUGUSTINE COURTAULD

1904–1959

The elder son of Samuel Augustine Courtauld, "August" as he was known, was born in Bocking, Essex, in 1904. He was educated at St. Christopher's, a preparatory school at Eastbourne, at Charterhouse and at Trinity College, Cambridge, where he took his degree in engineering and geography. August did not take kindly to school life; an independent and adventurous spirit rarely does. He was miserable there, but as so often happens with shy and retiring people he found his place in the society of mankind at the University where he spent three happy years.

After taking his degree in 1926, he decided to go to the Arctic and was fortunate enough to meet James Wordie who was organizing a summer expedition to east Greenland, the main object of which was to take gravity readings in the Franz Josef Fjord area and if possible to explore the mountains of the Petermann Peak range. Next year, in the spring of 1927, August set off with Francis (now Lord Rennell) and Peter Rodd for the mountains of Aïr in the southern Sahara. Landing at Lagos, the party travelled by train to Kano and thence by camel to the River Niger, where a motor-boat took them to Timbuctoo; thence to Dakar and home in the spring of 1928. This expedition was certainly one of the major explorations carried out by August, but little, so far as I know, has been written about it and consequently it has largely escaped notice. August says in his autobiography that on his return home he was taken by his parents to the Riviera to become civilized, but "after a week I could find nothing more to see on the Riviera, so I travelled home third class to sail my boat." I never knew August, except for some exceptional reason, travel anything but the cheapest class—after all "Third" goes just as fast, in England at any rate.

After a short period, which was not a success, with a firm of stockbrokers in the City, we find August once more with Wordie on his way to Greenland in 1929. This time the object was to climb Petermann Peak which had only been seen on the previous expedition. This was successfully achieved; the height was found to be 9300 feet and not 14,000 as previously thought.

Early in 1930 August met H. G.—"Gino"—Watkins, who was then planning a (for that time) large expedition to Greenland to explore the possibilities of an air route to western Canada by the shortest route. It was largely due to this fortuitous meeting that the British Arctic Air Route Expedition was able to materialize, for without the very generous financial support that August obtained from members of the Courtauld family, Watkins could not have carried out his aims—for which Gino was ever grateful; yet he would say it was he who owed so much to Gino, such was August's humility and modesty. It was upon this expedition that August volunteered to remain alone at the expedition's weather station on the Greenland ice plateau, 110 miles inland. The winter relieving-party had encountered such severe weather, and consequently had taken so much longer to reach the station than usual, that it was impossible to leave enough food and fuel for two men with safety. The alternative was to abandon the station. On the way up August had been thinking of this possibility and proposed that he should be left alone as there was enough food for one man for five months. Naturally Watkins endeavoured to relieve August before this period of time, but neither several aeroplane flights nor the first sledge party were able to find the station and it was exactly five months later when Watkins, Rymill and Spencer Chapman reached the completely snowed-up tent to find August safe and well in mind and body. He wrote in his memoir "Naturally I worked out all the possible things that could have happened to prevent them coming to me . . . yet as time went on, I began to feel complete confidence. I knew that if Gino was having to wait for better weather

he wouldn't let me down. I began to realize that I should not be left to die. I came to know that I was held by the Everlasting Arms." It was this same strong and deep faith which sustained him during his long illness.

On his return to England in 1931 he married Mollie Montgomerie whom he had known since childhood; he bought a yacht which he named *Duet* and which has ever since given his family and many friends much happiness. August was a magnificent seaman and his knowledge of ships and their history was profound. He held a Board of Trade Yacht Master's Certificate. In 1935, he returned to Greenland with his wife to make the ascent of the Watkins Mountains which had been seen in 1930. With the coming of the war he served throughout in the R.N.V.R. It was August who, in 1936, had been largely responsible, by his delightful stubbornness with authority, for the formation of the Royal Naval Volunteer Supplementary Reserve in spite of official doubts as to its value.

After the War he threw himself into public work. He was a member of the Essex County Council, the Council of the Essex Agricultural Society, Essex Rural Community Council, Essex Association of Boys' Clubs, Group Hospital Committees and many other bodies. He was, for a time, a member of the Committee of Management of the Scott Polar Research Institute and of the Council of this Society and one of our Honorary Secretaries from 1948–51, until his health gave way. But his keen interest in exploration and in the Society continued; in June 1958, although undergoing treatment abroad, he came back for two days in order to be present at Sir Vivian Fuchs's Trans-Antarctic lecture. In a wheeled chair, this was his last appearance in the Society's building. Shortly before his death he made his son Julien a Fellow; Christopher had become a Fellow in 1955, and it is good to know that the name of Courtauld will continue in the Society's records. He was made a Deputy Lieutenant of Essex in 1947, and a Justice of the Peace. In 1953 he became High Sheriff of Essex and it was in the latter part of this year that he was stricken by his last illness. In 1956 he was appointed a Vice-President of the Royal National Life Boat Institution to which he was a generous donor. Yet in spite of these high offices he remained the modest, self-effacing person he had been as a boy; he much enjoyed the company of his friends and all were sure of a warm welcome at his house, though he gave the impression that he wondered why people should "bother" with him, so completely oblivious was he of his personal charm. One of his last acts was to found a trust to help causes which "wouldn't get much help otherwise." The name he chose for this trust sums up his pholosophy of life, "The Augustine Courtauld Do-Good Fund." Could there be a more fitting memorial?

QUINTIN RILEY

CHARLES CAMSELL, C.M.G.

1876–1958

With the death of Charles Camsell, C.M.G., a Gold Medallist of the Society, passed one of the last of the explorers of the western mainland of Canada and an outstanding civil servant. He was one of eleven children and was born in 1876 in the Northwest Territories where his father was a Factor of the Hudson's Bay Company. He spent his childhood on the banks of the Liard River, and these early years in contact with trappers, Indians, and fur traders of the north-west were a wonderful preparation for his travels to come. Here he learnt as a boy how to live off the country, drive dogs, and travel by canoe. He left home when he was eight years old to attend St. John's College school in Winnipeg and the University of Manitoba, where he graduated in natural science at the age of eighteen. On his return to his homeland on the drainage of the Mackenzie River he spent the next four years under the pioneer conditions of northern fur trading posts. In the the fall of 1897 he joined a party heading for the Klondike via the Liard and Frances rivers in the Yukon, but after spending the summer prospecting Frances Lake, and suffering near starvation, they turned back. The next two

years were spent in the Cassiar district of northern British Columbia where, among other things, he carried mail by canoe and dog team, hunted, and survived many hardships and privations. In the spring of 1900, on returning to his home region, he met James Mackintosh Bell who, at twenty-two years old, a year younger than himself, enlisted him in his party of the Geological Survey of Canada. Bell's exploration that summer is outstanding, but it was largely Camsell's knowledge of how to travel and live in the region that enabled Bell to do so much. The next three years, filled with this life in the wilderness Camsell loved so much, brought contacts with all strata of humanity and developed to a fine point his natural, and phenomenal, physical stamina and open character. He excelled in every practical thing and was famous for his powers of endurance and for conducting his canoe through rapids no Indians would face. He was particularly known for the quiet, sympathetic and friendly dignity he showed to all, whatever their station in life. It was this that later overcame the difficulties with hostile Indians when exploring the Severn River and which ringed his campfire in the Tulameen country with prospectors who were led by it to confide in him the precious secrets of their work. In later years it stood him in good stead and carried him far in dealings with men, whether in scientific institutions, society, or executive circles of government. Camsell's meeting with Bell was the turning point in his life and led him to extend his education in geology with studies at Queen's and Harvard Universities, and finally at the Massachusetts Institute of Technology.

In 1904 he was appointed to the Geological Survey. He was employed in exploration at once, but probably his most important journey was made in 1905 when he was sent to explore and map the Wind and Peel rivers in the Yukon. The six years that followed were spent during winters in Vancouver and during summers around Princeton, Hedley, and Tulameen in southern British Columbia. The reports and memoirs he wrote on his work here brought him wide recognition as a geologist, especially his memoir on the unusual gold deposits of the Hedley camp. The next three years he continued working in British Columbia and in 1914 he was appointed geologist in charge of exploration and was told to plan the exploration of northern Canada. His paper on "The unexplored areas of continental Canada," published in the *Journal* for 1916, briefly describes this work. In the summer of 1914 he mapped a large area between Lake Athabasca and Great Slave Lake. In 1915 he joined the Royal Canadian Engineers, but was recalled to the Civil Service and assigned to the Munitions Board and Canadian Munitions Resources Commission, for whom he worked until 1918 when he rejoined the Geological Survey.

In 1920 he was made Deputy Minister of Mines, the department of which the Geological Survey was a branch, and in 1935, when four departments of government were amalgamated as the Department of Mines and Resources, he was appointed its Deputy Minister, a post he held until 1946. In 1935 he also became Commissioner of the Northern Territories. During the time he was Deputy Minister he did much to build up the Mines Branch of his department and to make it a splendid research organization for the expansion of the Canadian mining industry. His influence on the mining industry, and in fact on all scientific work in Canada, was remarkable. There were few important scientific committees or societies with which he was not involved. In 1930 he was President of the Royal Society of Canada. His contribution to geography was recognized by the award of the Murchison Grant in 1922 and the Founder's Medal for 1945 and he will be particularly remembered as the founder and first President of the Royal Canadian Geographical Society and one of the founders of the Arctic Institute of North America. When he retired after forty-four years of public service he continued to be very active in scientific and mining fields.

He married Isabel Doucie Thomas in Vancouver in 1905, and is survived by his widow, one son and two daughters.

H. S. BOSTOCK and DIANA M. R. ROWLEY

CORRESPONDENCE

THE KARSTLANDS OF JAMAICA: COCKPITS OR ROUNDED HILLS?

In accounting for the cockpit karst of Jamaica Dr. Marjorie Sweeting (*Geogr. J.*, **124** (1958), pp. 184–99) stresses the importance of solution in producing the cockpits. One is naturally led to suppose that the dominant features are the cockpits. The naming of the county "Cockpit Country" lends further support to this view, and section 3*b*, p. 191, well-nigh confirms it. Judge the surprise of those of us not unfamiliar with limestone country, but ignorant of Jamaica, when the air photographs of the Cockpit Country included in the paper portray almost exclusively round topped hills with hardly a semblance of enclosed rounded hollows—or cockpits in the normally understood sense. It is hardly an exaggeration to state that the air photographs show country almost as unlike limestone country in the advanced stage of the karst cycle as any area of high relief could be. It resembles more a riot of dissected chalk downs. Is it really all like this, or are some of the air photographs upside down? Certainly photograph 3, p. 198, is correct, as the cloud shadows show. In this photograph, too, are the only recognizable cockpits—small ones lying between the maze of round-topped hills to the north-east, and the ridge-and-furrow country to the south-west. What is the feature encroaching on the cultivated ground shown in the top left-hand corner of photograph 4? It looks like the results of gully erosion, and if it is, then this photograph is the wrong way round (unless the "shadows" are shrubs), and when corrected the rounded hills become cockpits or solution hollows. But I suspect that Dr. Sweeting will not allow this genuine resemblance to karst features.

Almost identical country to that shown in Figure 3 is better reproduced in Plate 2 of Mr. Paget's "Land use and settlement in Jamaica" ('Geographical essays on British tropical lands,' Philip, 1956). It is worth noting that Mr. Paget in his Figure 2 has the caption "'Cockpits'; closely spaced but rounded hummocks," which accurately describes the features shown in the air photographs even if it leaves one still more puzzled as to why the term "cockpit" has ever been applied to such country.

Finally may I be forgiven for pleading that geomorphologists attempt to account for the land forms as they really are, and not to repeat general assertions about "a mature development of the karst land forms . . .," assertions which seem to bear so little relevance to the land forms shown in the air photographs.

W. V. Lewis

Department of Geography,
Cambridge,
23 *March* 1959

Dr. Sweeting replies:—

Mr. Lewis has kindly sent me a copy of his letter referring to my article on "The karstlands of Jamaica" (*Geogr. J.*, **124** (1958), pp. 184–99). I am glad to have the opportunity to answer his comments.

The first point I wish to make is that the air photographs have been reproduced correctly. Because of the ease with which the eye inverts the relief, the photographs were arranged with the south at the top, so that the light could appear as coming from the top left hand corner; this enables the illustrations to be viewed more easily. Photograph 3 in my article is, I believe, a reproduction of part of exactly the same print used by Mr. Paget for Plate 2 of his essay ("Land use and settlement in Jamaica," in 'Geographical essays on British tropical lands'). It is quite clear that the misunderstandings about the correct way up of the photographs would have been solved by the use of illustrations in the form of stereo-pairs. Mr. Lewis is not the only person who has been puzzled by the photographs. As aerial photographs will be used

more and more in the future to illustrate land forms, he has made a good case for the greater use of stereo-pairs in British geographical literature.

The most important point touched upon by Mr. Lewis in his letter seems to me to be that relating to the terminology of the "cockpit" karst. It occurred to me when I was writing the article that the term *cone* (or *Kegel*) karst was perhaps a better term for land forms about which I was writing. I do in fact use *Kegel* (or *cone*) karst at the foot of the page 186, when the subject is first introduced and on page 188 I describe the cockpit karst as a "succession of cone-like hills with alternating enclosed depressions." There were several reasons when I wrote the article for retaining the term cockpit karst, despite the fact that when the country is seen from aerial photographs the conical hills appear as the more dominant land forms than the depressions. The first reason is that the "Cockpit Country" in Jamaica is a firmly established regional name where this type of relief is particularly well developed. Secondly, "cockpit" relief or simply "cockpits" used as a descriptive term has a long historical use going back to the original Survey of Sawkins (1869), and is still used by members of the Geological Survey of Jamaica who apparently regard it as suitable. And thirdly, though it is impossible to separate the growth of the depressions from that of the conical hills, the term cockpit seemed to give stress to the dominance of solution as the main process involved, a reason which I feel would have Mr. Lewis' endorsement. On thinking over the question, however, I think it is evident that *cone karst* is probably the better term to use; it is also nearer to the German equivalent, *Kegel Karst*.

As to Mr. Lewis's comments on the relief itself: limestone relief in parts of the humid Tropics differs so markedly from limestone relief in temperate areas that I am not surprised that Mr. Lewis finds the Jamaican land forms unrecognizable. This point I have tried to make myself (p. 186) and it has been stressed by many workers in karst morphology (*Erdkunde*, **8**, 1954). Each of the hollows shown in the photographs is an enclosed depression, though I agree that they are not like the dolines which Mr. Lewis has seen in Europe. Furthermore, the roundness of the hills is partly an illusion due to the dense vegetation cover, a point also made by Mr. Paget in his essay (p. 192). I can assure Mr. Lewis that the relief is indeed a "riot," hence my quotation from Sawkins at the beginning. However, any analogy to chalk country is very confusing and attempts to see these tropical land forms through ideas developed in temperate areas sometimes hinders our comprehension of tropical relief. We British geomorphologists have been slow to accept this fact.

Mr. Lewis asks about the "recognizable cockpits" in photograph 3. The small area of cockpits that he mentions is the area of "doline" karst referred to by me on page 193 (lines 32–4); this is of course the type of karst landscape with which Mr. Lewis is familiar. He also asks about "the feature encroaching on the cultivated ground shown in the top left-hand corner of photograph 4." This cultivated area is on the flat alluvial floor of the Lluidas Vale *polje*; across this wanders a stream which sinks into the alluvium just outside the area of the photograph. Mr. Lewis is therefore quite right in saying that this feature is the result of stream (or gully) erosion; such stream action is quite usual on *polje* floors and is a normal accompaniment to certain types of limestone relief.

In his final paragraph Mr. Lewis makes a plea that geomorphologists should avoid using what he calls "general assertions." I suspect that this is in part an attack on the increasingly technical nature of land form study. To answer this aspect of Mr. Lewis's comment would make this letter far too long. To return to my use of the phrase "mature development." This phrase is used twice in my article. First, on page 186, where "a mature development of the karst land forms has had time to take place" is used in the same sense as the phrase actually used by Mr. Lewis in his letter, *viz.* "limestone country in the advanced stage of the karst cycle." Both these statements are general assertions used to convey the fact that the land form processes have been acting for a long period of time and imply that a sequence of land forms can be recognized. It is arguable that more simple words would convey the meaning more closely.

Secondly, on page 195, the statement, "These facts are in accord with the concept of a mature karst development" is used quite deliberately. It follows after a series of facts given about the nature of the underground water flow in the Cockpit Country and was intended to refer indirectly to former and current work on the nature of ground water flow in limestone areas; in a short article it was not possible to enlarge upon this and the question is dealt with in some of the references given.

Is it possible that by his last remarks Mr. Lewis wants us to abandon our attempts at generalizing in our discussions on the origin of land forms? Individual land forms must of course be accurately described in language (non-mathematical or mathematical) appropriate to the subject. But surely one of the objects of land form study is to produce generalizations or "laws" concerning land forms? Such generalizations will relate to both the processes which control land form development and also to the nature of their sequential development. If Mr. Lewis feels that the words "mature development" resemble too much what has come to be regarded (not necessarily correctly) as out-moded "Davisian" morphology, let him read my conclusion more closely. Here, it will be seen that one of the main points of my article is to show that a cycle of land form development, as put forward by Grund in 1914, is seen to be untenable and that our more detailed knowledge of the land forms now enables us to see Grund's original generalization applying only in special conditions. This use of generalizations is common scientific practice and progress in the study of land forms will take place in no other way.

M. M. SWEETING

Department of Geography,
Australian National University,
Canberra, A.C.T.
Australia,
14 *April* 1959

SOUTH GEORGIA SURVEY

On page 37 of the March *Journal* Mr. Carse, in assessing the cost of his admirable survey of South Georgia, says "On the basis of £6350 direct from the taxpayer's pocket (Crown Agents) . . ." which rather suggests that this money came from the pocket of the U.K. taxpayer. It did not, of course, but was provided from the Falkland Islands Dependencies revenue.

MILES CLIFFORD
(Sir Miles Clifford)

49 *Hanover Gate Mansions,*
*Regent's Park, N.W.*1.
4 *May* 1959

MEETINGS: SESSION 1958–9

Meeting of 2 February 1959. The President in the Chair

Paper: Trans-Polar voyage of U.S.S. *Nautilus*. By Dr. Waldo Lyon

Meeting of 9 February 1959. Mr. Leonard Brooks in the Chair

Films: 'Himalayan awakening' and 'Route des cimes'

Meeting of 16 February 1959. The President in the Chair

Elections to Fellowship: Miss Margaret E. Acors, B.A.; J. Edward Blacksell, B.A.; Lindel Winston Brown; Peter K. Brown; Roland Frederick William Buggey, B.SC. (Econ.); Thomas Ronald England, B.A.; Walter Raymond Gaulton; Rev. James

Frederick Hardman; Gordon Harris; Peter Thomas Humphrey, B.A.; Rev. Raymond Jacob; Anthony Clive Jermy; Huw Roland Jones, B.A.; John Michael Lonsdale; David John Morrish, M.SC.; John Neale, B.A.; Robert Stanley O'Keefe; Miss Betty Belchem Skinner; Miss Nora Miriam Slaney; William Keith Thomas; A. Thompson; Thomas R. Tregear; Sharad Chandra Balakrao Wasnikar; Eric John Widdicombe; Gordon Williams; Mrs. Margaret H. Parry-Williams

Elections to Associate Membership: Miss P. A. Thwaites

Paper: Mongolia, 1958. By Group-Captain H. S. C. Smallwood

Meeting of 23 February 1959. Sir James Wordie in the Chair

Paper: Glaciological research on the Trans-Antarctic Expedition. By J. G. D. Pratt and Dr. Hal Lister

Meeting of 2 March 1959. Mr. Leonard Brooks in the Chair

Elections to Fellowship: Michael Charles Bray; Roy C. Bridges; Mrs. P. I. Harris-Clarke; H. C. Ivimey-Cook; John L. Francis; Daniel E. Hogan; George G. Jones; Captain G. M. Howard-Knight; Roy A. Laing; Edward L. Lewis; Douglas G. Lister; B. R. Maharaj; S. J. H. Naqvi, M.A.; Flying Officer Ivan R. Powell, B.SC.; Francis P. Wall; Miss Zinaida Waloff, M.SC.

Elections to Associate Membership: John H. Galloway; Derek Thompson; John B. Thompson

Films: 'Everyday except Christmas' and 'The travel game'

Meeting of 9 March 1959. The President in the Chair

Elections to Fellowship: Mrs. Elizabeth Chilver; John L. Pepys-Cockerell; Douglas J. W. Cullum; Stanley L. Duff; C. A. East; Paul Edwardson; Roger Hadfield; Charles Hawtin; Brigadier J. V. Davidson Houston; F. C. Ogden; Edmund S. Powell; Leo Smith; Eric W. Stanton; John H. Taylor; J. Matthews-Thomas; William Thompson; Godfrey U. Ukairo; Roger P. Plowden-Wardlaw

Elections to Associate Membership: Miss Marion Breeze; Miss P. A. Eardley

Film: The Trans-Antarctic Expedition

Meeting of 23 March 1959. Professor L. Dudley Stamp in the Chair

Paper: Some aspects of agriculture and settlement in Peru. By C. T. Smith

Meeting of 6 April 1959. Mr. Leonard Brooks in the Chair

Elections to Fellowship: Peter C. S. Campion; John A. Edmundson; Rev. Paul E. Freed; Rev. Ralph Freed; Miss E. J. Haygarth; Nigel Heseltine; Miss B. Lancaster; J. M. Lithgow; Mrs. Richard Tolson; Mrs. M. R. Whiteside

Election to Associate Membership: Miss U. B. Halang

Film: 'Adventure on'

Meeting of 13 April 1959. The President in the Chair

Elections to Fellowship: Clive Bell, B.A.; Kenneth Bradford; Mrs. M. Brightman; Edward A. Daniel; John G. Durnall, B.SC.; Richard E. M. Fitch; Miss Joyce M. Haley; Robert B. Harrison; Squadron Leader John J. Hughes; Igor S. Loupekine; Mrs. B. D. Wade-Palmer; Mrs. T. Parkin; O. A. A. Peters; Gerald Pyett; Wing Commander Sidney Rawlins; G. E. Roberts; Mrs. R. Rogers; Frederick B. Salt; William H. Shepherd; G. E. Silberman; Alan F. Smith; Mrs. Roma Stephenson; Leslie E. Thompson; P. A. S. Twinn; Desborough Wright; Rev. Theodore T. Y. Yeh

Election to Associate Membership: Miss Janet H. Hutcheon

Paper: The underwater exploration of ancient Apollonia. By Lieutenant N. C. Flemming

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE, LONDON, S.W.7

FELLOWSHIP AND ASSOCIATE MEMBERSHIP

The object of the Society being the Promotion and Diffusion of Geographical Knowledge, it has always welcomed to its Fellowship those anxious to further this object by their interest and support, as well as those able to take a more active part in the work of discovery and exploration.

FELLOWSHIP

The Bye-Laws provide that a candidate for admission to the Fellowship of the Society must be proposed by a Fellow personally known to him and seconded by another Fellow. Further, that a candidate is not eligible until he (or she) is twenty-one years old, unless he holds a Commission in Her Majesty's Forces or he (or she) is a matriculated student of a University of the United Kingdom or the Self-Governing British Dominions. Proposal forms can be obtained on application to the Director and Secretary.

Every Fellow shall be required to pay on election *either* £4 as Entrance Fee and £4 as Annual Subscription for the current year and thereafter an Annual Subscription of £4 due on 1st January in each year; *or* a single compounding fee of £60.

The Entrance Fee and first Annual Subscription may be paid in four quarterly instalments of £2 each; *or* the Entrance Fee and first two Annual Subscriptions may be paid in four half-yearly instalments of £3 each. Thereafter the Annual Subscription may continue to be paid in four quarterly instalments of £1 each or two half-yearly instalments of £2 each respectively. Entrance Fee and Annual Subscription may be paid by instalments only where payment is made by Banker's Order. Half-yearly instalments shall be due on the 1st January and the 1st July; quarterly instalments shall be due on the 1st January, 1st April, 1st July and 1st October.

For Fellows who are under the age of 25 years on election the Entrance Fee shall be reduced from £4 to £2. The Entrance Fee and first Annual Subscription may be paid in four quarterly instalments of £1 10*s*. 0*d*. each *or* the Entrance Fee and first two Annual Subscriptions may be paid in four half-yearly instalments of £2 10*s*. 0*d*. each: thereafter payment may be by instalments as above. Entrance Fee and Annual Subscription may be paid by instalments only where payment is made by Banker's Order.

Fellows may compound for their Annual Subscriptions at any subsequent time by a payment of £60 less £2 for each Annual Subscription paid in excess of five with a minimum of £20 after 25 payments.

No Fellow shall be entitled to vote or to enjoy any privilege of the Society while in arrear.

ASSOCIATE MEMBERSHIP

The Bye-Laws covering the terms of Associate Membership provide that—

1. *A candidate must be not less than 17 and not more than 20 years of age. He (or she) must be recommended by a Fellow, University or School authority.*

2. *Subscription shall be £2 per annum without Entrance Fee.*

3. *On attaining the age of 21 Associate Members become eligible for Fellowship. The Entrance Fee of £2 shall be waived provided they have been Associate Members for 3 years. Otherwise Associate Membership shall cease at the age of 21.*

All subscriptions are payable in advance, on the 1st of January in each year.

PRIVILEGES OF FELLOWS AND ASSOCIATE MEMBERS

The privileges of a Fellow or Associate Member include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Society's House, Library and Map-room. Each Fellow is also entitled to receive a copy of *The Geographical Journal*. Associate Members have the choice of receiving either *The Geographical Journal* or *The Geographical Magazine*. Associate Members may not describe themselves as F.R.G.S. and have no vote at Annual or Special General Meetings.

A pamphlet giving details of the Society and a copy of the Charter and Bye-Laws will be sent on application to the Director and Secretary.

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